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A STUDY OF THE RELATIONSHIP BETWEEN
MEMBER ATTITUDES AND ORGANISATIONAL
EFFECTIVENESS IN A STRATEGIC MISSILE
WING (SAC) OPERATIONS DIRECTORATE

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Several studies have examined the attitudes of members of SAC missile units to discover the reasons why the missile career field has suffered from low morale. However, there have not been any attempts to uncover the relationships between member attitudes and organizational effectiveness in a SAC missile wing. The purpose of this study was to identify the significant relationships between member attitudes and organizational effectiveness in a strategic missile wing operations directorate. Data on both attitudes and organizational effectiveness were collected from the 44th Strategic Missile Wing Operations Directorate at Ellsworth AFB, South Dakota with a survey questionnaire. Three significant relationships between attitudes and organizational effectiveness were identified through the statistical techniques of factor analysis and canonical correlation analysis. The strongest relationship showed that satisfaction with work, supervision, the organization's decision-making structure, and communication from management concerning performance measurement, is directly related to productivity and the ability to anticipate problems that might come up in the future. The research proved that there are relationships between specific dimensions of worker attitudes and specific criteria of organizational effectiveness in a strategic missile wing operations directorate and that it is possible to identify them through multi-variate analysis.

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Presented to the Faculty of the School of Systems and Logistics
of the Air Force Institute of Technology

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In Partial Fulfillment of the Requirements for the
Degree of Master of Science in Logistics Management

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has been accepted by the undersigned on behalf of the
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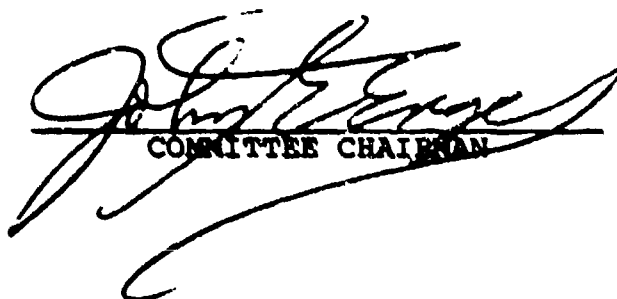

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CHAPTER I

INTRODUCTION

During recent management research there have been attempts to search for relationships between organizational effectiveness and attitudes. Such a discovery might provide managers with valuable information that could be used to improve organizational performance. Certainly, one reason managers attempt to motivate their employees has to do with the assumption that improvement in their motivation or attitudes will result in, or be associated with, improved organizational effectiveness. Is this assumption valid? Are employee attitudes related to organizational effectiveness? If they are related, what are the specific relationships between the two elements? These are the basic questions explored in this research.

A sector of the United States Air Force that has been the subject of a number of attitude studies is the missile force of the Strategic Air Command (3; 7; 10; 14; 21). A conclusion that one can easily develop through reviewing the results of these studies is that SAC's missile force is not one of the more highly motivated groups of individuals in the military. In fact, previous research on missileer attitudes has shown that a considerable amount

of dissatisfaction exists within the SAC missile force (3:2). While these research efforts have explored the attitudes of members of SAC's missile force, they have not attempted to uncover the relationships that might exist between member attitudes and organizational effectiveness. Does dissatisfaction among the members of SAC's missile force have an impact on the effectiveness of SAC's missile organizations? Considering the degree of destructive capability that is controlled by SAC's missile crews this would appear to be a question of importance to military managers at all levels of command.

Problem Statement

The organizations that have direct operational responsibility for SAC's missile combat crews and ICBMs are the strategic missile wing operations directorates. A discovery of the specific relationships between member attitudes and the effectiveness of a missile wing's operations directorate could suggest areas of concentration for future programs designed to improve missileer morale and missile unit effectiveness. The specific problem addressed in this research is to determine if the attitudes of members of a strategic missile wing operations directorate are related to the directorate's effectiveness.

Literature Review

In order to provide some background on relationships between effectiveness and attitudes, a literature review was conducted. The literature review encompasses four major areas: (1) effectiveness, (2) attitudes, (3) relationships between attitudes and effectiveness, and (4) effectiveness and attitudes in strategic missile wing operations directorates.

Effectiveness

One of the first problems encountered in an investigation of organizational effectiveness is to arrive at acceptable definitions of terms. Definitions of organizational effectiveness have characteristically been of a theoretical rather than empirical nature (6:184). However, attempts to define effectiveness have typically included certain common elements. Basically, a definition of organizational effectiveness should consider (1) the objectives of the organization and (2) the means through which the organization is sustained and by which the objectives are attained (13:535). Georgopoulos and Tannenbaum identified several basic kinds of objectives which tend to be common to many organizations (13:535). First is the presence of high unit output in terms of the results desired by the organization; these results may be either quantitative or qualitative in nature. The second characteristic objective

is the ability to identify external factors of change and to be able to absorb and to assimilate change when appropriate. A third factor is the ability of the organization to preserve its resources, both human and material. If the organization's output can be quantified, as is the case for some industrial enterprises, the process of measuring an organizational activity's contribution towards its objectives becomes relatively straightforward. However, if quantifiable productivity measures are inapplicable or are excluded, it becomes somewhat nebulous as to how attainment of objectives can be related to effectiveness. Research has illustrated that findings concerning factors such as morale, turnover rates, and absenteeism are inconsistent (13:534). Even certain quantifiable measures, such as net profit, may have little meaning as a basis for evaluation or comparison because they are highly susceptible to external fluctuations. Even so, it is necessary to arrive at a definition from which an attack on the problem can be made. Taking into account the factors described above, Georgopoulos and Tannenbaum defined organizational effectiveness in the following manner:

We define organizational effectiveness as the extent to which an organization as a social system, given certain resources and means, fulfills its objectives without incapacitating its means and resources and without placing undue strain upon its members [13:535].

Two popular approaches to defining organizational effectiveness are (1) the goal approach, and (2) the systems approach. The goal approach rather simply defines effectiveness in terms of organizational goal achievement. The problem with this approach stems from the fact that:

1. goals are prescribed by the organization, and the actual or operational goals may be different and thus difficult or impossible to ascertain, or;

2. goals are derived from factors external to the organization and may not constitute a valid basis for evaluation (28:3).

In any event, adherents of the goal approach have failed to develop general measures of effectiveness (28:7). Therefore, work in this area remains largely theoretical and difficult to operationalize.

The systems approach relates effectiveness to an organization's ability to take advantage of its situation and to be successful in terms of acquiring resources that are scarce and of much value (28:3). This process necessitates an ability to measure vague concepts such as what constitutes value, and the consensus is that a single measure is incapable of adequately assessing effectiveness. It then follows that multiple measures are required and the approach becomes too diversified to be of practical use.

A study conducted by Mahoney and Weitzel used the notion that organizational effectiveness is, in general terms, the ability to perform efficiently and productively (22:361). Also, a major criterion of effectiveness involves the degree to which the organization is able to handle emergency situations and to concentrate on primary organizational goals. Their research indicated that, while past attempts to define effectiveness had viewed criterion as global in nature, such global criterion are actually a function of a set of more specific factors, which, depending upon the situation, might vary (22:365). With the acceptance of global criterion as a function of specific dimensions, it is possible to identify certain factors as exerting a direct influence on the global criterion. Thus, while accepting the previous work involving organizational effectiveness, with all of its faults and shortcomings, it is still possible to isolate factors within the general problem area and to determine what relationships do constitute effectiveness and contribute to its attainment.

From a review of the literature one might conclude that the development of appropriate measures of organizational effectiveness is as difficult, if not more difficult, than defining the meaning of organizational effectiveness. Cunningham examined the different models of organizational effectiveness, developed in the literature, to see if an appropriate basis for assessing organizational effectiveness

could be uncovered. He concluded that the selection of a method for measuring organizational effectiveness depends on the information the decision maker requires and the applicable situation (9:463). Cunningham summarized his conclusions as follows:

The applicability and relevance of each approach depend on the particular organizational problem that has to be resolved. The manager or researcher must determine whether the problem concerns the performance of the organization's structure or human resources or both, or its impact on the environment. The various strategies allow a wide latitude in evaluating an organization's effectiveness [9:473].

In a study of seventeen multivariate models of organizational effectiveness, Steers found little consistency in effectiveness measurement criteria. The criteria that were used to evaluate effectiveness in these seventeen models and their frequency of occurrence are listed in Table 1. One of Steer's basic conclusions was that organizational effectiveness is extremely complex. In his study Steers referred to effectiveness as a "construct" (32:551).

A construct is an abstract idea rather than a concrete phenomenon. It is based on the hypothesis that several variables will consistently covary or fit together to form a unified whole [32:551].

Steers suggested that much research needs to be done before the effectiveness construct can be usefully employed or measured in organizations (32:555).

In another recent study (1977) Kirchoff claimed that, "Neither the goal approach models nor the evaluation

TABLE 1
FREQUENCY OF OCCURRENCE OF EVALUATION CRITERIA IN
17 MODELS OF ORGANIZATIONAL EFFECTIVENESS [32:549]

Evaluation Criteria	No. of Times Mentioned (N=17)
Adaptability-Flexibility	10
Productivity	6
Satisfaction	5
Profitability	3
Resource acquisition	3
Absence of strain	2
Control over environment	2
Development	2
Efficiency	2
Growth	2
Integration	2
Open communications	2
Survival	2
All other criteria	1

models have adequately measured organizational effectiveness [19:352]." From his findings, Kirchoff concluded that, since complex organizations pursue multiple goals and effectiveness must be measured relative to goals, there is no ultimate criteria of effectiveness (19:352).

An example of effort directed towards developing measures of organizational effectiveness and determining some of the characteristics of organizations that contribute to effectiveness is provided in the work of Mott. Mott defines organizational effectiveness "as the ability of an organization to mobilize its centers of power for action-production and adaptation [23:17]." In other words, effective organizations display an ability to produce more output of a better quality than other similar organizations (23:17). The major, or common, objectives of most organizations involve the quantity of output, the quality of the output, and the efficiency with which the output is produced. The problem is to identify what characteristics of an effective organization will result in accomplishing the criterion of quantity, quality, and efficiency as described above.

In his study Mott identified three characteristics that could be used as a basis for evaluating an organization's effectiveness in accomplishing its objective criterion. The three characteristics identified were:

1. Productivity in terms of the quantity and quality of the output produced by the organization, and the efficiency with which the output is produced;

2. Adaptability in terms of the organization's ability to anticipate and solve problems, keep current with new technologies and methods applicable to the organization, and accept and adjust to problem solutions; and

3. Flexibility in terms of the organization's ability to handle temporary work overloads and emergencies (23:20).

The methods developed by Mott for measuring and evaluating these characteristics provide a basis for examining an organization and for determining the extent to which these characteristics contribute to the effectiveness of that organization.

Attitudes

Before attitudes and effectiveness can be compared it is necessary to consider what an attitude is. Numerous definitions of the term "attitude" are presented in the literature. Cook and Seltiz prefer to think of an attitude

. . . as an underlying disposition which enters, along with other influences, into the determination of a variety of behaviors toward an object or a class of objects, including statements of beliefs and feelings about the object and approach avoidance actions with respect to it [8:23].

Kiddler and Campbell claim that terms such as "acquired drive," "fixation," "judgement," "stereotype," and "valance" can all be considered functionally synonymous with the term "attitude" (33:1). Sherif and Sherif provide an operational definition of the term "attitude."

Operationally, an attitude may be defined as the individual's set of categories for evaluating a stimulus domain in interaction with other persons and which relate him to various subsets within the domain with varying degrees of positive or negative affect [31:300].

Sherif and Sherif have identified several characteristics of attitudes that differentiate the concept from other concepts that refer to the internal states of an individual:

1. Attitudes are not innate. They are learned.
2. Attitudes are not temporary states. They do change but not with the ups and downs of the homeostatic functioning of an organism or with small changes in stimulus conditions.
3. Attitudes imply a relationship between a person and objects. These objects may be other persons, groups, institutions, inert physical objects, values, social issues, or ideologies.
4. The relationship between the person and the object is not neutral. It has motivational-affective properties.
5. The subject-object relationship is accomplished by forming categories that differentiate between the objects

and between the person's positive or negative relation to objects in these various categories (31:298).

In 1928 Thurston presented a rather concise but complete definition of the concept "attitude." Thurston used the term

. . . to denote the sum total of a man's inclinations and feelings, prejudice or bias, preconceived notions, ideas, fear, threats, and convictions about any specified topic [34:128].

Based on the definitions presented in the literature, in this study the term "attitude" will be used to describe the feelings, beliefs, and convictions an individual develops concerning various facets of his job.

The way that an employee develops attitudes toward his job has been the subject of a number of work-behavior research studies. Many of these studies are based on versions of the basic need-satisfaction model of job attitudes (Maslow-1943, 1954, 1970; Porter-1962; Alderfer-1969; Herzberg, Mausner, and Synderman-1959; Argyris-1973). The components of the need-satisfaction model are job characteristics, needs, and job attitudes. The need-satisfaction model is quite simple. The model suggests that people have stable, relatively unchanging, identifiable needs and that jobs have stable, identifiable characteristics. Job attitudes are presumed to result from a correspondence between individual needs and job characteristics (29:427-428).

When the characteristics of the job are compatible with the person's needs, the assumption is made that the person is satisfied and, on occasion, the further argument is made that the person will be more motivated to perform the job [29:428].

Salancik and Pfeffer (1978) claimed that there are a number of problems with the need-satisfaction model which are due to the model's failure to take into account "... the social context of work and the presence of consequences from previous actions [30:224]." Salancik and Pfeffer developed another model which they refer to as "a social information processing approach."

The social information processing approach proceeds from the fundamental premise that individuals, as adaptive organisms, adapt attitudes, behavior, and beliefs to their social context and to the reality of their own past and present behavior and situation [30:226].

When explaining the social information processing approach, Salancik and Pfeffer suggested that social information communicated by co-workers has a significant impact on an individual's job attitudes. Due to a strong desire to "fit-in," it is likely that the individual will develop job attitudes that are consistent with the information he receives from co-workers. The social information processing approach allows for the integration of some existing literature and leads to some interesting predictions but, because of its short history, it does have some loose ends and unanswered questions (30:227).

Relationships Between Attitudes and Effectiveness

Now that effectiveness and attitude literature have been explored it is necessary to get to the central question at issue in this study--Are attitudes related to organizational effectiveness? During the past sixty years a number of studies have examined relationships between attitudes and organizational effectiveness, and relationships between attitudes and organizational performance.

During the 1930s there was a noted increase in the interest in relationships that might exist between employee attitudes and employee performance in an organization. A strong stimulant to this increase in interest was provided by the Hawthorne studies (27:4). The Hawthorne studies were conducted by Roethlisberger and Dickson at the Hawthorne Plant at the Western Electric Company in the late 1920s. These studies were originally conducted for the purpose of assessing the impact of working conditions (lighting, rest pauses, etc.) on the productivity of the employees in the plant (26:369). An example of what happened during these studies involved changing the intensity of light available to a group of workers.

The idea was that when the light became brighter, production would increase, and when the light became dimmer, production would decrease--all very commonsensical, of course. The workers were told they would be observed as an experimental group. The lights were turned up and the production went up. The lights were turned down and the production went up. Roethlisberger

and Dickson were disconcerted. They dimmed the lights to near darkness and production kept climbing [17:64-65].

The results of the Hawthorne studies suggested that physical working conditions might not impact productivity as much as other factors, such as psychological and social influences on the attitudes of the workers involved (26:369).

The Hawthorne studies kicked off a wave of theorizing and research into the relationships between worker attitudes and performance (27:4). Porter and Lawler claimed that the relationship between job attitudes and job performance is important because it can make contributions both to a motivational theory of work behavior and to organizational practices designed to increase effectiveness (20:27). In 1967 Porter and Lawler developed a theoretical model for studying the relationships between managerial attitudes and performance. In their theoretical model it was hypothesized that high performance would result in high satisfaction only if it decreased the gap between the perceived equitable level of rewards and the amount seen as being actually received (27:36). Empirical studies based on Porter and Lawler's model were carried out in seven organizations. Three of these organizations were divisions of state governments and the other four were privately owned manufacturing companies (27:48). One of the most important findings from these empirical studies

was that attitudes were related significantly to performance as predicted by the model (27:142).

Frederick Herzberg is another management theorist who discovered that job attitudes correlate positively with high job performance. In the late 1950s Herzberg, Mausner, and Snyderman conducted an attitude study of industrial workers in the Pittsburgh area. The major findings of their study indicated that job attitudes are a powerful force and are functionally related to the productivity, stability, and adjustment of the working force. Their results also showed that differences between job satisfiers and job dissatisfiers involve both a qualitative and a quantitative difference in effects (18:96). Specifically, they discovered that ". . . the positive effects of high attitudes are more potent than the negative effects of low attitudes [18:96]."

Since the Hawthorne studies other research efforts have shown that job attitudes do correlate positively with job performance. Mowday, Porter, and Dubin conducted a study of the relationships between work unit performance, and employee attitudes and situational characteristics. The subjects of the study were 411 female clerical workers in 37 branches of a large California bank. The results of the study demonstrated that employee attitudes were significantly related to work unit performance. Employees in work units rated high on performance had a higher level

of satisfaction as measured by positive attitudes toward their work unit and the organization of which the work unit was a part. Employees in low and medium performing work units had a lower level of satisfaction toward the work unit and the organization as a whole (24:231).

Wanous conducted a research study in which job satisfaction and performance data were collected from about eighty recently hired female telephone operators. Causal information was taken from this data using a combination of cross-lagged and dynamic correlations. The result was that the relationship between satisfaction and performance was slightly positive, but the direction of causality was unclear. This result suggested that performance causes intrinsic satisfaction and extrinsic satisfaction causes performance (35:139).

It should be pointed out that not all studies of attitudes and performance have concluded that there are significant relationships between the two. Zalesnik, Christensen, and Roethlisberger conducted a study (1954-1955) that examined the relationships between motivation, productivity, and satisfaction in the small work group. The organization chosen for the study was a medium-sized company located in a large city in the Eastern United States (36:79). One of the questions examined in this study had to do with whether or not productivity and satisfaction are related. Basically, the results showed

that there is little correlation between satisfaction and productivity (36:86).

One of the more renowned studies which showed no significant relationship between employee attitudes and job performance was conducted by Brayfield and Crockett. After a review of the literature Brayfield and Crockett claimed that there was little available evidence to conclude that employee attitudes, of the type usually measured in morale surveys, related to performance on the job (5:408). Reporting on the results of a research study of fourteen homogeneous occupational groups and one large sample of factory workers, Brayfield and Crockett stated ". . . statistically significant low positive relationships between job satisfaction and job performance were found in two of the 15 comparisons [5:402]."

Engel conducted a study of attitude-effectiveness relationships at the Warner Robins Air Logistics Center, Georgia, in 1977. Engel used Mott's effectiveness criteria, discussed previously, to measure organizational effectiveness. For attitude measurement he used an employee attitude survey developed by the Air Force Logistics Command. The results of Engel's study indicated that worker attitudes are related to specific criteria of organizational effectiveness (12:1). However, the findings of Engel's study are limited to civil service workers at the Warner Robins Air Logistics Center. Engel indicated that additional

studies using different populations must be made before any generally applicable conclusions can be accepted (12: 99).

Effectiveness and Attitudes in
Strategic Missile Wing
Operations Directorates

The Strategic Air Command uses various methods to evaluate the effectiveness of its missile wings. Two of the primary methods involve evaluations conducted by the SAC Inspector General and the 3901st Strategic Missile Evaluation Squadron. The SAC Inspector General conducts periodic no-notice inspections of SAC's missile wings. These Operational Readiness Inspections (ORIs) are conducted with the primary aim of measuring a unit's capability of carrying out its part of SAC's wartime mission. The 3901st Strategic Missile Evaluation Squadron at Vandenberg AFB, California also makes periodic visits to SAC's missile wings for the purpose of evaluating mission accomplishment and capability.

It was mentioned in the introduction to this research study that a number of research efforts have examined the attitudes of SAC's missile crews. Missile crewmembers make up the majority of the population of a strategic missile wing operations directorate. While the general conclusions of research studies by Cancellierri and Willoughby, Ashbaugh and Godfrey, Driscott, Gilkeson

and Maes, suggest that SAC's missile crew force is not very motivated, none of these studies have attempted to relate attitudes to organizational effectiveness (3; 7; 10; 14; 21). It appears that there is a need to conduct such an effort. In fact, when suggesting areas for future research, Ashbaugh and Godfrey, and Cancellieri and Wiloughby suggested that an evaluation of attitudes relative to individual and unit performance in SAC missile organizations is a fruitful research area that could provide beneficial information to Air Force managers (3:118; 7:120).

Objective

The objective of this research is to identify the significant relationships between member attitudes and organizational effectiveness in a strategic missile wing operations directorate.

Hypothesis

The following research hypothesis will be tested:
There are significant relationships between member attitudes and organizational effectiveness in a strategic missile wing operations directorate.

CHAPTER II

METHODOLOGY

The Research Questionnaire

Data on attitudes and organizational effectiveness were collected with a survey questionnaire (Appendix A). The questionnaire contains sixty questions that measure attitudes and eight questions that measure the effectiveness of an organization as perceived by the organization's members. All of the questions are based on a five-point Likert scale (11:248). Prior to conducting the statistical analysis, numerical values were assigned to the question responses as follows: A=5, B=4, C=3, D=2, and E=1.

Attitude Data

The attitude questions (questions 1-60) were taken from an organizational effectiveness and employee attitude questionnaire that was originally developed by the Air Force Logistics Command and used in previous Air Force attitude studies (12:26-30). Engel used this questionnaire in his study of the relationship between attitudes and organizational effectiveness in the Warner Robins Air Logistics Center Maintenance Directorate. Engel's study included a factor analysis of the attitude data collected with the questionnaire, which made possible the identification of

those questions which were the best measures of the attitude factors that the questions were designed to measure. Selection of the sixty attitude questions used in this research was based on the results of Engel's factor analysis and suggestions from members of the Air Staff who reviewed the questionnaire before it was administered.

Effectiveness Data

Effectiveness was measured with eight questions developed by Mott, who established three general areas for the measurement of organizational effectiveness, as follows:

1. Productivity in terms of how much is produced, the quality of the product, and the efficiency with which the product is produced (questions 61-63);
2. Adaptability in terms of the ability to anticipate and solve problems, keep current with new technologies and methods applicable to the organization, and accept and adjust to problem solutions (questions 64-67);
3. Flexibility in terms of the ability of the organization to handle temporary work overloads and emergencies (question 68) (23:20).

These eight questions were designed with the intent of providing a valid subjective measure of organizational effectiveness that could be obtained with relative ease and little expense, especially in organizations where the collection of effectiveness information is difficult (12:18).

Therefore, for the purpose of this research, this group of questions was viewed as an acceptable organizational effectiveness measuring tool.

Mott's analysis of the effectiveness questions indicated that they do in fact measure different aspects of organizational effectiveness. Mott conducted validity studies of the effectiveness measures, using rank order correlations between scores based on the effectiveness measures and top management ratings, and between scores based on the effectiveness measures and ratings by people in other units. These correlations were significant at the 5 percent level, indicating that there was a considerable amount of agreement on the relative effectiveness of the organizations in question (23:193).

In his study of the Warner Robins ALC, Engel compared the responses to the eight effectiveness questions with computerized effectiveness ratings provided by the Performance Analysis Branch at Warner Robins ALC. Results of this comparison showed a significant amount of agreement between the two types of effectiveness measures (12:74-76).

Based on the results of the studies conducted by Mott and Engel it was assumed that the eight effectiveness questions were valid measures of organizational effectiveness. Therefore, the decision was made that, for the purpose of this research it would not be necessary to try to validate the effectiveness questions by comparing their results

to the results of evaluation methods (such as ORIs) that are traditionally used to measure the effectiveness of missile wing operations directorates.

Population

The unit from which the attitude and effectiveness data was collected is the Operations Directorate of the 44th Strategic Missile Wing, located at Ellsworth Air Force Base, South Dakota. This unit is responsible for the alert readiness of all assigned missile combat crews at Ellsworth and for the operational support of 150 Minuteman ICBMs and their associated launch control facilities. The Operations Directorate is made up of nine organizations or divisions. These include three combat crew squadrons, and the following divisions: training, standardization/evaluation, administration, plans, facilities management, and codes. Missile combat crewmembers in the grades of Second Lieutenant to Major make up the majority of the unit's population. There are a number of enlisted personnel assigned to the unit who perform duties such as administration, facilities management, and trainer maintenance. There are also other officers in the unit, besides crewmembers, who are assigned to staff positions.

Sampling Plan

The unit manning strength of the Operations Directorate was 330 when the survey was administered. A census

of the population was attempted. Questionnaires were distributed to all 330 military members of the Operations Directorate. The response rate that was actually achieved is discussed in Chapter III.

Analysis Plan

Canonical correlation analysis is the statistical method that was employed to identify relationships between attitudes, as measured with questions 1-60, and the effectiveness measures based on Mott's eight effectiveness questions (questions 61-68). Due to the large number of attitude questions used in this research it was necessary to reduce the attitude data to a smaller number of interpretable factors, via the technique of factor analysis, before the canonical correlation analysis could be attempted.

Factor Analysis

Factor analysis is a statistical method that can be used to reduce a large number of variables to a few interpretable constructs (1:209). It is a multivariate statistical technique that focuses on the study of interrelationships among a total set of observed variables. When factor analysis is applied to a set of observed variables each of the variables is, in a sense, considered to be a dependent variable which is a function of some underlying, latent factor. A factor is a linear combination of a number of observed variables. The observed variables

may be grouped in such a manner that there is more than one factor (1:213-214).

Thus, we may have the following relationship:

$$F_1 = a_{11}x_1 + a_{21}x_2 + a_{31}x_3$$

$$F_2 = a_{42}x_4 + a_{52}x_5$$

$$F_3 = a_{63}x_6 + a_{73}x_7$$

Here, a total of seven variables are grouped in three factors in which the first factor consists of the first three variables (X_1, X_2, X_3), the second factor, the next two variables (X_4, X_5), and the third factor, the last two variables (X_6, X_7) [1:214].

The a_j 's ($j=1, \dots, n$) are derived on the principle of least squares as in multiple regression. The a_j 's are regression coefficients (1:213). When factor analysis is applied to a sample, each element of the sample is assigned a factor score. A factor score is a prediction similar to the predicted score \hat{y}_i in multiple regression. Each sample element is assigned a factor score for each factor (1:214).

When the factor score is correlated with the observed score on each variable, the resultant correlation is called a "factor loading." If there are n variables and r factors, there will be a total of $(n \times r)$ factor loadings. These are summarized in a matrix called the "factor loadings" matrix. It is a matrix of correlations among observed variables and factors [1:214].

The sum of the squares of the loadings on a factor represents the amount of total variance in the sample data accounted for by that factor. This sum of squares of factor loadings is called the "eigenvalue" of the factor.

When the eigenvalue is divided by the number of variables the percent of total variance in the sample data accounted for by the factor is obtained. The total variance of a variable accounted by all the factors is called the "communality" of that variable. It is determined by summing the squares of each of the factor loadings for the particular variable (12:34). The communality ". . . indicates the amount of the variance of a variable that is shared by at least one other variable in the set [25:475]."

Table 2 shows a simple factor analysis solution matrix which is illustrated in the Engel study for explanation purposes. Questions 1 through 6 are the observed variables. The 6x2 matrix is the matrix of factor loadings. For example, question 1 has a .23 loading on factor A. The eigenvalue for factor A is 1.98. Therefore the percent of total variance in the data accounted for by factor A is $1.98/6 = .33$. The communality of question 1 is .66. This means that 66 percent of the variance in question 1 is accounted for by factors A and B. From this example it could be inferred that factor A accounts for questions 3, 4, and 6 while factor B accounts for questions 1, 2, and 5.

There are numerous possibilities for the application of factor analysis. Kim claims that the specific applications of factor analysis are bounded only by the user's imagination (25:469). The following three categories represent the most common applications of factor analysis:

TABLE 2
ORTHOGONALLY ROTATED FACTORS (12:36)

Question	Factors		Communality (h^2)
	A	B	
1	.23	.78	.66
2	.18	.82	.70
3	.78	.18	.64
4	.77	.14	.63
5	.25	.75	.61
6	.78	.21	.66
Eigenvalue	1.98	1.92	3.90
% of Variance	0.33	0.32	0.65

1. Exploratory uses--the exploration and detection of patterning of variables with a view to the discovery of new concepts and a possible reduction of data;
2. Confirmatory uses--the testing and hypothesis about the structuring of variables in terms of the expected number of significant factors and factor loadings; and
3. Uses as a measuring device--the construction of indices to be used as new variables in later analysis [25:469].

There are a number of different options available to the researcher who uses factor analysis. There are different types of factor analysis, and different rotation methods. For this research principal factoring with iteration (PA2) was used. PA2 is the most widely accepted factoring method and can handle most of the factoring needs of a user (25:480). When PA2 is used the main diagonal elements of the correlation matrix contain communality estimates obtained through an iteration procedure (15:29). When a user chooses PA2 he assumes that the extracted

factors will not account for all of the variance in the data (25:480). For this research it was assumed that the factors would not account for all of the variance; this was the reason for selecting PA2, which is the default option in SPSS. (This assumption was supported when the factor analysis was accomplished since the resulting factors that were extracted accounted for a total of 70.7 percent of the variance in the data.)

As far as rotation is concerned, the two most common rotation methods used in attitude measurement are orthogonal varimax rotation and oblique rotation (12:35). For this research, orthogonal varimax rotation was chosen over oblique rotation for two reasons. First, a major objective of the factor analysis was to rotate the factor matrix to a structure that facilitated interpretation of the factors as much as possible. The results of orthogonal varimax rotation are usually easier to interpret than the results of oblique rotation (12:35). Second, when canonical correlation analysis is performed to identify the relationships between two data sets, the relationships may be obscured by multicollinearity if variables within the data sets have not been reduced to linearly independent variates (or relatively independent variables) before the canonical analysis is conducted (2:139). So another reason orthogonal varimax rotation was used was that the factor axes are

orthogonal, and therefore the dimensions are relatively uncorrelated (12:38).

SPSS gives the researcher the opportunity to control the number of factors that are extracted from the data. This may be done with the NFACTORS parameter which is used to specify the desired number of factors or with the MINEIGEN parameter which specifies a minimum eigenvalue (25:492-493). For the purpose of this research there was no reason to obtain a specific limited number of factors, so the NFACTORS parameter was not used. The SPSS default minimum eigenvalue criteria for extracting factors is set at 1.0. If this default criteria is used the program automatically deletes all factors with an associated eigenvalue less than 1.0 (25:493). This was considered acceptable for this research so the minimum eigenvalue criteria was not changed.

The factor analysis was also used to build factor scores for each questionnaire respondent. A factor score represents the degree to which a particular respondent got high scores on the group of questions that load high on the factor in question (1:224). The factor scores were treated as if they were raw data and were used as input data (representing the attitude dimensions) to the canonical correlation analysis.

A significant part of this research involves interpretation of the factors produced by the factor analysis.

Interpretation of the meaning of the factors was necessary to understand what attitude dimensions the resulting factors represent. Harris claimed,

By far the most common procedure for interpreting (naming) the factors resulting from a principal components analysis or a factor analysis is to single out for each factor those variables having the highest loadings (in absolute value) on that factor. The highly positive loadings then help to define one end of the underlying dimension, while the high negative loadings (if any) define the opposite end [16:218].

In this research, interpretation of a factor was based on a careful examination of the questions that had strong loadings associated with the factor in question. A detailed explanation of the interpretation of each factor produced by the factor analysis is included in Chapter III.

Canonical Correlation Analysis

Once the factor analysis was complete, two sets of variables were available; a set of eight variables that measure organizational effectiveness and a set of attitude dimensions that are based on the results of the factor analysis. Canonical correlation analysis was used to analyze the two sets of variables for the existence of relationships between them. Canonical correlation analysis derives a linear correlation from each of two sets of variables in such a way that the correlation between the two linear combinations is maximized. Many pairs of linear combinations, called canonical variates, may be derived. Canonical correlation analysis produces these linear

combinations of the original variables with the object of accounting for a maximum amount of the relationship between the two sets of variables (25:517).

The SPSS subprogram CANCORR, which was used in this research, produced two sets of canonical variates; one set for the attitude dimensions and one set for the organizational effectiveness measures (25:517). "The essential point to the canonical correlation analysis is that canonical variates from each subset are meant to correspond, . . . [25:517]." The first canonical variate from the set of attitude dimensions and the first canonical variate from the set of organizational effectiveness measures were chosen so that they maximally correlate with each other. This also occurred in the selection of the second and all successive pairs of canonical variates (25:517). Each canonical variate pair that is produced by canonical correlation analysis has a loading associated with each input variable. In the case of this research, for each canonical variate pair produced, there was a loading associated with each attitude factor and a loading associated with each organizational effectiveness variable. The nature of the canonical relationships was inferred by noting the sign and the magnitude of the loadings in each of the canonical variate pairs (2:189).

Information concerning the statistical significance of the relationships is included in a statistical summary

table that is part of the canonical correlation analysis output. This table includes the eigenvalue, the canonical correlation coefficient, and the statistical significance of each relationship. For this research a significance level criteria of .05 was chosen to determine which relationships are significant. A significance level of .05 is the most common criteria used to determine the significance of relationships identified by canonical correlation analysis (2:189). Rejection or acceptance of the research hypothesis was based on this criteria.

It should be emphasized that canonical correlation analysis is designed to illustrate the relationships that might exist between two sets of variables as opposed to relationships between individual members of the sets. For example, assume that a canonical correlation analysis is conducted to uncover the significant relationships between two sets of variables; set 1 includes the variables A01 to A06 and set 2 includes the variables B01 to B06. Also, assume that the canonical correlation analysis identified one statistically significant relationship, or canonical variate pair, as illustrated in Table 3. Based on the loadings, a proper interpretation would be that there appears to be a relationship between a subset which includes variables B02 and B06, and a subset which includes variables A01, A02, and A04. In other words, whenever B02 and B06

TABLE 3

SAMPLE CANONICAL CORRELATION ANALYSIS OUTPUT

Coefficients for Canonical Variables of the Second Set

	<u>Canvar 1</u>
B01	.07636
B02	.62314
B03	.01542
B04	-.15627
B05	.21432
B06	.55647

Coefficients for Canonical Variables of the First Set

	<u>Canvar 1</u>
A01	.49072
A02	.44628
A03	.00293
A04	.46731
A05	-.01457
A06	-.11634

are present, A01, A02, and A04 are likely to be present (12:38-41).

The SPSS subprogram CANCORR is designed to manipulate intercorrelations among variables to see if a particular type of pattern exists in the data. The actual interpretation of the pattern is left to the researcher (25:518). Therefore, an important part of this research is the subjective interpretation and explanation of the statistically significant relationships between attitudes and effectiveness measures that were identified by the canonical correlation analysis. Interpretation of the identified relationships is explained in Chapter III.

The diagram illustrated in Figure 1 summarizes the experimental design that constitutes the research methodology. To begin with there were sixty attitude variables and eight organizational effectiveness variables. The sixty attitude variables were reduced to a smaller number of attitude factors via the technique of factor analysis. The attitude factors and eight organizational effectiveness variables were then input to the canonical correlation analysis which identified significant relationships between the attitude factors and the organizational effectiveness variables.

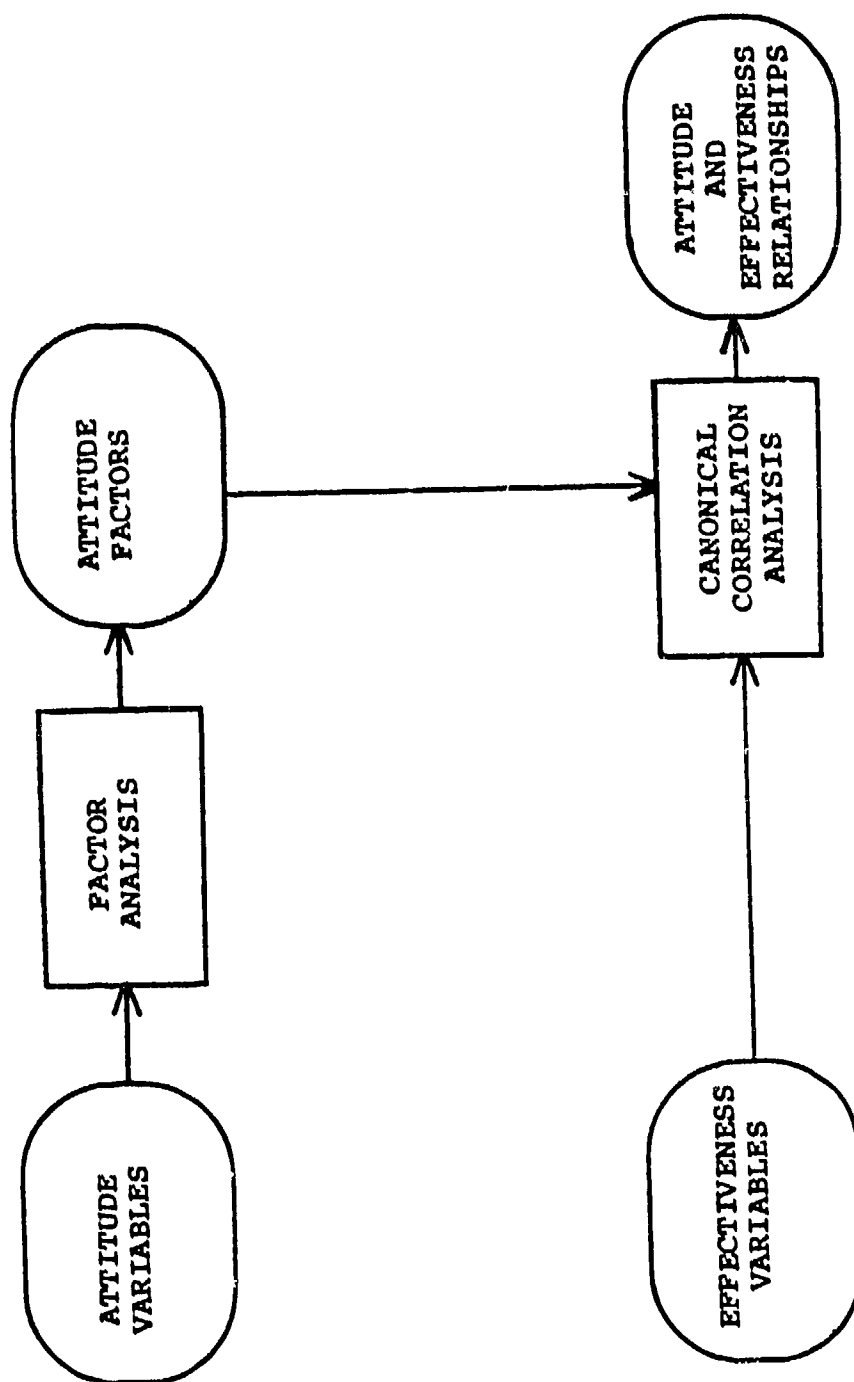


Fig. 1. Experimental Design

CHAPTER III

DATA ANALYSIS

This chapter describes the analysis of the data and includes the following:

1. A discussion of the bias in the data that exists because some members of the population did not respond to the survey.
2. A discussion of the factor analysis results and the interpretation of each factor.
3. A discussion of the canonical correlation analysis results.

Questionnaire Responses

Questionnaires were distributed to all 330 members of the 44th Strategic Missile Wing Operations Directorate, and 167 of the questionnaires were completed. This constitutes a response rate of 51 percent, so there exists a possibility of data bias due to nonrespondents. Bias could result if the attitudes of the nonrespondents are different from those attitudes of the people who did, in fact, complete and return questionnaires. One way to combat this kind of bias is to conduct a follow-up survey of those members of the population who did not respond. This was not possible due to limitations such as time,

the voluntary nature of the initial survey, and a desire to maintain complete respondent anonymity.

Based on the results of previous studies that have examined the attributes of people who tend to respond to surveys, it can be assumed that the people who responded to this survey are likely to be those who are more knowledgeable, are more interested in the subject, and have stronger feelings about the subject (11:283). Therefore, if there is bias in the data, due to nonrespondents, it may not necessarily be a bad situation when one considers what we are trying to accomplish with this research. One reason for making such a claim is that in this research organizational effectiveness is being measured through the perceptions of individuals. It seems logical to assume that those who are more knowledgeable and more interested in the subject are likely to be better judges of the true effectiveness of the organization. Therefore, a more accurate picture of the unit's effectiveness might be achieved with some nonrespondents than if responses from every member of the organization were obtained. Another reason bias may not necessarily be bad is based on the major objective of this research which is to identify the significant relationships between member attitudes and organizational effectiveness. If those who responded to the survey have strong feelings about the subject it is more likely that stronger relationships between attitudes

and effectiveness would surface from an analysis of the survey results than if the opinions or feelings were not as strong. This would make it easier to uncover the significant relationships between attitudes and effectiveness. Therefore, considering what we are trying to accomplish with this research, any data bias that may exist is not considered bad; in fact, it may even be an advantage.

Factor Analysis

When the attitude data was factor analyzed, using principal factoring with iteration and orthogonal varimax rotation, fourteen factors were extracted. The fourteen factors account for a total of 70.7 percent of the variance in the attitude data. Table 4 contains the eigenvalues and the percent of variance accounted for by each factor. Appendix D contains the varimax rotated factor matrix.

Interpretation of the meaning of a factor was based on the variables that have significant factor loadings on the factor in question. Bennett and Bowers made the following comments concerning the criteria for determining the significance of factor loadings:

There are several different criteria which we may use; a simple rule of thumb procedure is to allow that the loading of the variable on the factor is significant if the loading is $\pm .03$ or more. This is not based on any rigorous statistical foundation but is a conservative criterion which ensures that only those factors having a reasonably strong association are

TABLE 4
EIGENVALUES AND PERCENT OF VARIANCE ACCOUNTED
FOR BY EACH FACTOR

Factor	Eigenvalue	Pct of Var	Cumulative Pct
1	19.46398	32.4	32.4
2	3.89621	6.5	38.9
3	2.86107	4.8	43.7
4	2.11549	3.5	47.2
5	1.88145	3.1	50.4
6	1.77614	3.0	53.3
7	1.63669	2.7	56.1
8	1.52876	2.5	58.6
9	1.37028	2.3	60.9
10	1.32108	2.2	63.1
11	1.28354	2.1	65.2
12	1.16019	1.9	67.2
13	1.11410	1.9	69.0
14	1.02671	1.7	70.7

identified as being significant. Providing the sample is reasonably large this procedure should prove satisfactory; it has the virtue of being quick and simple to use but does have the disadvantage that a significant factor loading may be neglected; however, it is better perhaps to err on the side of caution [4:10].

Therefore, a factor loading was assumed to be significant if its absolute value is greater than or equal to 0.3.

The remainder of the discussion of the factor analysis results is given to interpreting each factor. The five questions (or fewer if there are less than five) with the strongest loadings on the factor (absolute value above 0.3) are listed prior to the discussion of each factor interpretation.

Factor 1

<u>Loading</u>		<u>Question</u>
.811	17.	Your supervisor understands human relations.
.784	16.	Your supervisor is a capable individual.
.782	15.	Your supervisor tries to strike a balance between people needs and production needs.
.753	14.	Your supervisor is well qualified for his/her job.
.743	1.	Your supervisor takes time to listen to job problems.

Factor 1, the strongest factor, accounted for 32.4 percent of the variance in the attitude data. The meaning of this factor is clear since all of the questions with high loadings on this factor contain specific reference to the individual's supervisor. It was determined that factor 1 represents satisfaction with the immediate supervisor.

Factor 2

<u>Loading</u>	<u>Question</u>
.825	32. Everything considered, your job is very satisfactory.
.793	19. How much satisfaction do you gain from the performance of your job?
.707	37. Time passes quickly for you on the job.
.689	26. How often would you encourage others to seek a job like yours?
.636	22. Your work assignment is challenging.

Question 32, which has the strongest loading on factor 2, has to do with general job satisfaction. Question 19 is a bit more specific since it relates to satisfaction that an individual gains from the performance of his job. This factor appears to address an individual's satisfaction with his work. This assertion is supported by the other questions that load high on this factor. If a person is satisfied with his work it is likely that time will pass quickly for him on the job, that he might encourage others to seek a job like his, and that his work assignment will be challenging.

Factor 3

<u>Loading</u>	<u>Question</u>
.854	41. You can obtain the parts needed to do your job.
.781	38. You can obtain tools and/or supplies when they are needed.
.702	40. Equipment needed to accomplish the job is available.
.666	39. Your equipment is well maintained.
.337	51. Do you feel your co-workers are working at their full capacity?

The four questions with the highest loadings on factor 3 are all associated with the availability or condition of materials, such as equipment, tools, supplies, and parts, that are needed to accomplish the job. This factor represents attitudes toward the availability of materials needed to accomplish the job. The significant loading of question 51 on this factor seems reasonable since the availability of sufficient materials will have an impact on the ability of people to work at their full capacity.

Factor 4

<u>Loading</u>	<u>Question</u>
.734	57. How often do you feel that the right decisions are made at upper levels of management?
.713	59. Do you feel that decision makers at wing level are aware of squadron level problems?
.613	60. Do you feel decisions are made at the proper level of supervision?
.555	58. How often do you feel that the right decisions are made at intermediate levels of management?
.519	55. Do you feel that upper levels of management understand the problems you face in doing your job?

The common element in the five most significant questions that load on factor 4 is the feeling that a worker has about the management levels at which decisions are made in the organization. It is clear that factor 4 represents satisfaction with the organization's decision making structure.

Factor 5

<u>Loading</u>	<u>Question</u>
.659	10. You know the quality standards required for your work.
.526	7. Are you helped in correcting errors you make?
.390	18. Do you feel that decisions which affect your job are based on technical or engineering analyses?
.369	9. You understand how the quality of your work is measured.

Questions 10 and 9 imply that this factor represents the sufficiency of communications from management concerning work quality standards. If such communication is good, or effective, then workers will know the quality standards required for their work and they will know how the quality of their work is measured. Questions 7 and 18 support this contention; part of the communication from management concerning work quality standards will be feedback about errors when work quality standards have not been attained. Feedback is an important segment of managerial use of quality standards to improve organizational performance. The amount of technical and engineering analysis that goes into establishing standards will have an impact on the appropriateness of the standards.

Factor 6

<u>Loading</u>	<u>Question</u>
-.515	29. Do you see constraints to high production in your job?

LoadingQuestion

- | | |
|-------|---|
| -.502 | 20. Think about the specific duties of your job. How often have you felt unable to use your full capabilities in the performance of your job? |
| -.390 | 23. Do you feel you need more freedom in your job assignment to get the work done? |
| -.353 | 12. Your job is oversupervised. |

Questions 29 and 20 deal with the presence of constraints that prevent high productivity and performance at full capacity. If such constraints are present they might cause the worker to feel that he needs more freedom in his work assignment to get the work done. Oversupervision is one example of a constraint that might cause these kinds of results. This factor addresses attitudes toward the presence of constraints to job performance and productivity.

Factor 7LoadingQuestion

- | | |
|-------|--|
| .662 | 45. You are involved in establishing your production goals. |
| .505 | 30. You help to set the goals of your unit. |
| .463 | 8. You help set your own quality goals. |
| .335 | 53. Communication between the people in your unit and the wing staff is good. |
| -.320 | 52. Employees in your area have difficulty in relating their work effort to physical output and/or services. |

Questions 45, 30, and 8 deal specifically with worker participation in the goal setting process. Question 53 also relates to participation in goal setting since it deals with communication with a higher level of management. Increased participation in goal setting would naturally be

accompanied by a greater amount of communication between the worker and higher management levels. Question 52 does not appear to have any clear connection with the other questions. However, since the four questions with the highest loadings are all related to the amount of participation that is allowed in the goal setting process, it was determined that this is what the factor represents.

Factor 8

<u>Loading</u>	<u>Question</u>
.692	43. You understand how the quality of your work is measured.
.612	42. You understand how your production output is measured.
.540	44. Do you understand how the output of your unit is measured?
.463	25. Your job description does reflect the assignments you are given.
.434	21. You get recognition when you deserve it.

Factor 8 appears to represent the workers' conception of the sufficiency of communication from management concerning performance measurement. Questions 43, 42, and 44 are directly associated with how well workers understand communications from management concerning work quality measurement, production output measurement, and unit output measurement. The association of the remaining two questions with this factor is not quite as clear. Question 25 has to do with the accuracy of an individual's job description; this question was viewed with the idea that a job description is a communication from management concerning the

general boundaries or guidelines that a worker is expected to perform within. There is a connection between a job description and performance measurement. The way that management measures a worker's performance will be affected by management's perception of how well the worker stays within the boundaries and guidelines identified by his job description. Therefore, the conclusion was made that the high loading of question 25 on factor 8 was a reasonable expectation. The relationship of question 21 to management communication concerning performance measurement also seems reasonable. The communication of deserving recognition is one way that management can provide feedback to a worker concerning the result of his performance.

Factor 9

<u>Loading</u>	<u>Question</u>
.578	33. Your rank is too low for the work you do.
.379	47. Would additional technical training improve your chances for promotion?
.376	53. Communication between the people in your unit and the wing staff is good.
.316	48. What part of your job could be performed by a person having less skill than you?

Questions 33 and 48 address the notion of the rank or skill level required for the job. Question 47 is also related to this idea since additional technical training is one way that a worker could increase his skill level.

Although a search was conducted to discover some commonality between skill level or rank and question 53, there did

not appear to be any reasonable correspondence. When factor analysis is accomplished spurious, unrelated loadings may occur, especially after the more significant factors (those with high eigenvalues) have been extracted (12:61). Engel claimed that when this occurs ". . . one can either search for some complicated relationship or consider the element spurious and not include it in the search for a common meaning [12:61-62]." Since a complicated relationship could not be uncovered, it was assumed that the loading of .376 on question 53 was spurious and the decision was made to not consider it in the interpretation of factor 9. Based on questions 33, 47, and 48 it was determined that factor 9 represents worker feelings about the rank or skill level required for the job.

Factor 10

<u>Loading</u>	<u>Question</u>
-.595	46. Material waste can be reduced in your unit?
-.301	47. Would additional technical training improve your chances for promotion?

There did not appear to be a common element among the two questions that had significant loadings on factor 10. Examination of questions with loadings less than 0.3 did not assist in clarifying the meaning of the factor. It was decided that this factor could not be interpreted.

Factor 11

<u>Loading</u>	<u>Question</u>
.556	50. Do you feel your co-workers are supporting the production effort in your unit?
.402	49. The people in your unit work together effectively as a team.
.321	27. If given the opportunity or choice would you follow your job to another location in the continental United States?

Questions 50 and 49 deal with attitudes toward co-workers. Question 27 does not seem to have an obvious commonality with questions 49 or 50 although there may be some indirect relationship. For example, a person's attitude toward his co-workers might have an impact on his desire to perform the same job at a different location with different co-workers. Based primarily on questions 50 and 49 it was determined that this factor represents attitudes toward the performance of co-workers.

Factor 12

<u>Loading</u>	<u>Question</u>
.476	54. How often do you successfully complete difficult jobs?
.362	35. You feel a sense of responsibility on your job.
.311	50. Do you feel your co-workers are supporting the production effort in your unit?
.304	36. You enjoy a feeling of responsibility on your job.

The question with the highest loading on factor 12, question 54, deals with the degree of difficulty of the job. With respect to questions 35 and 36, the amount of responsibility inherent in a job could add to the difficulty

of that job. Also, the amount of support that a worker gets from his co-workers could affect his feelings about the degree of difficulty of his job, which might explain the reason why question 50 had a significant loading on this factor. The interpretation was that factor 12 represents the degree of difficulty of the job.

Factor 13

<u>Loading</u>	<u>Question</u>
.464	34. You feel responsible for your own efforts at work.
.426	35. You feel a sense of responsibility on your job.
-.346	3. Does your immediate supervisor tell you how your job contributes to meeting unit productivity?

Factor 13 was interpreted as representing a worker's feelings concerning the amount of responsibility that he has on the job. Both questions 34 and 35 deal with worker responsibility. As far as question 3 is concerned, if a supervisor kept a worker informed as to how the worker's job contributes to unit productivity then it is reasonable to assume that such information would contribute to the worker's feeling of responsibility.

Factor 14

<u>Loading</u>	<u>Question</u>
.454	18. Do you feel that decisions which affect your job are based on technical or engineering analysis?
-.411	13. Your supervisor spends too much time away from his/her work area.

There did not appear to be an obvious common thread among the two questions that had significant loadings on factor 14. Questions that loaded less than 0.3 on this factor were also examined to see if a common meaning could be discovered for factor 14; however, this did not help. It was decided that factor 14 could not be interpreted, and a meaning was not assigned. This did not affect the results of the canonical correlation analysis since factor 14 was not a significant element in any of the significant relationships.

Table 5 is a list of the interpretations given to each attitude factor.

Canonical Correlation Analysis

After completion of the factor analysis, two sets of variables were available; a set of fourteen attitude factors, and a set of eight organizational effectiveness measures. The eight organizational effectiveness measures, along with their corresponding question numbers, follow.

<u>Question</u>	<u>Effectiveness Variable</u>
61.	Production Quantity
62.	Production Quality
63.	Efficiency
64.	Problem Anticipation
65.	Awareness
66.	Promptness of Adaptation
67.	Prevalence of Adaptation
68.	Flexibility

The objective of the canonical correlation analysis was to identify the statistically significant relationships

TABLE 5

FACTOR INTERPRETATIONS

Factor	Interpretation
1	Satisfaction with immediate supervisor
2	An individual's satisfaction with his work
3	Availability of materials needed to accomplish the job
4	Satisfaction with the organization's decision making structure
5	Communication from management concerning work quality standards
6	Presence of constraints to job performance and productivity
7	Amount of participation allowed in the goal setting process
8	Communication from management concerning performance measurement
9	Rank or skill level required for the job
10	No interpretation
11	Performance of co-workers
12	Degree of difficulty of the job
13	Amount of responsibility that an individual has on the job
14	No interpretation

between these two sets of variables. A relationship was considered statistically significant if it had a significance level of .05 or better. Based on this criterion three significant canonical relationships were identified.

The nature of a canonical relationship can be inferred by noting the sign and magnitude of the standardized canonical loading associated with each variable (2:189). When interpreting the meaning of the three significant canonical relationships, consideration had to be given to the algebraic sign and magnitude of both the factor and the canonical loadings, the mean scores for each variable, and the order of the question responses.

An examination of the factor analysis results, the questions with significant factor loadings, and the mean scores for these questions, revealed that strong positive loadings were associated with relatively high scores on a scale of one to five; strong negative loadings were associated with relatively low scores on a scale of one to five. Based on this observation and the order of question responses, the meanings of significant positive and negative loadings were interpreted individually for each variable that was input to the canonical correlation analysis. The results of these directional interpretations are shown in Tables 6 and 7.

These individual directional interpretations and the magnitudes and algebraic signs of the canonical loadings

TABLE 6

ATTITUDE FACTORS

Factor	Sign of Significant Loading	Interpretation
1.	+ -	High satisfaction with Immediate Supervisor Low satisfaction with Immediate Supervisor
2.	+ -	High satisfaction with work Low satisfaction with work
3.	+ -	High availability of materials Low availability of materials
4.	+ -	High satisfaction with decision making structure Low satisfaction with decision making structure
5.	+ -	Good communication from management concerning work quality standards Lack of communication from management concerning work quality standards
6.	+ -	Many constraints to performance and productivity Few constraints to performance and productivity
7.	+ -	High participation in goal setting process Low participation in goal setting process
8.	+ -	Good communication from management concerning performance measurement Lack of communication from management concerning performance measurement

TABLE 6--Continued

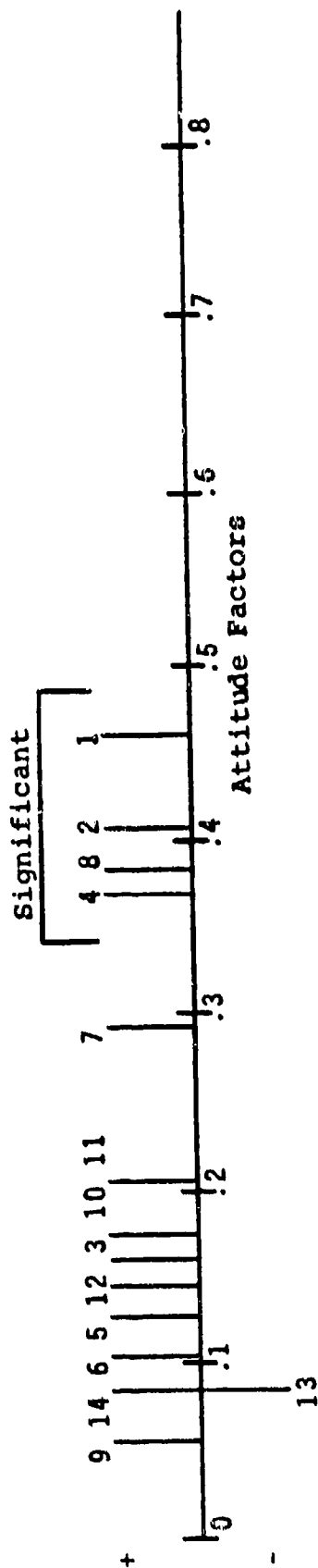
Factor	Sign of Significant Loading	Interpretation
9.	+	Rank or skill level is too low for the work that is done
	-	Rank or skill level is not too low for the the work that is done
10.	No interpretation	
11.	+	High satisfaction with co-worker performance
	-	Low satisfaction with co-worker performance
12.	+	High degree of job difficulty
	-	Low degree of job difficulty
13.	+	Large amount of responsibility
	-	Small amount of responsibility
14.	No interpretation	

TABLE 7
EFFECTIVENESS MEASURES

Variable	Sign of Significant Loading	Interpretation
61.	+ -	High production quantity Low production quantity
62.	+ -	High production quality Low production quality
63.	+ -	Low efficiency High efficiency
64.	+ -	Good job of anticipating problems Poor job of anticipating problems
65.	+ -	Low awareness High awareness
66.	+ -	High adaptation promptness Low adaptation promptness
67.	+ -	Low adaptation prevalence High adaptation prevalence
68.	+ -	Low flexibility High flexibility

made possible the actual interpretation of the meanings of the three significant canonical relationships. Determination of the importance of individual variables in each relationship was based on the magnitude of the canonical loadings. The group of variables that were considered significant in each relationship are the variables with the highest canonical loadings. In each canonical relationship, separation of the significant variables from those variables that were not considered significant was accomplished by placing each of the variables on a scale (from 0.0 to 1.0) in accordance with their canonical loadings and subjectively determining which variables appeared to be grouped together toward the high end of the scale. The results of this process are illustrated in Figures 2, 3, and 4. Each of these figures represents a significant relationship. In each figure there is a scale for the attitude factors and a scale for the effectiveness questions. On each scale there are marks which represent canonical loadings. For the attitude factors the marks are labeled with factor numbers; for the effectiveness variables the marks are labeled with question numbers. The marks that are above a line represent positive loadings while the marks below a line represent negative loadings.

A presentation of each of the identified relationships follows. Variables from the two data sets that were considered significant in each relationship are presented, along with their associated canonical loadings. Statistical



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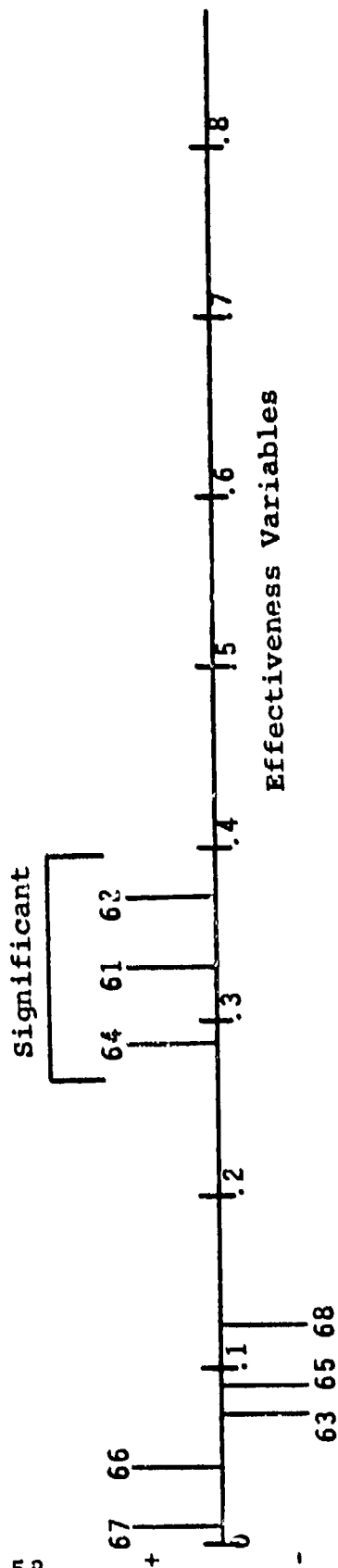
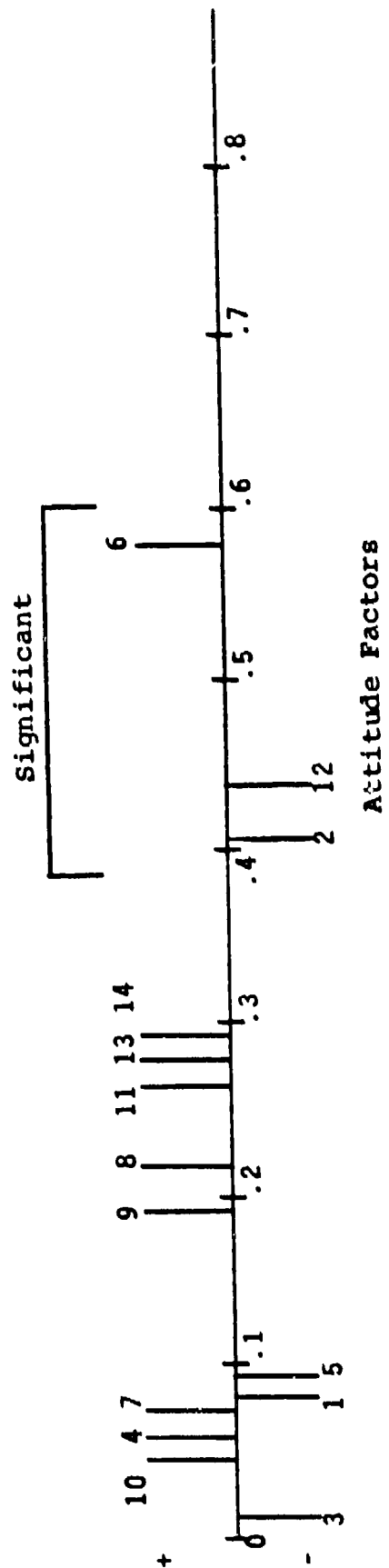


Fig. 2. Relationship 1



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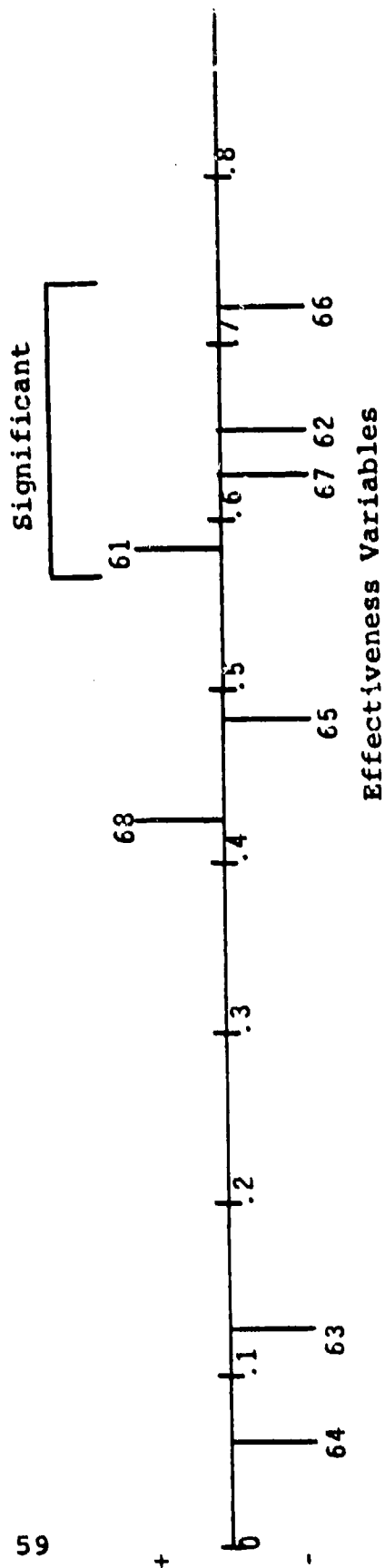


Fig. 3. Relationship 2

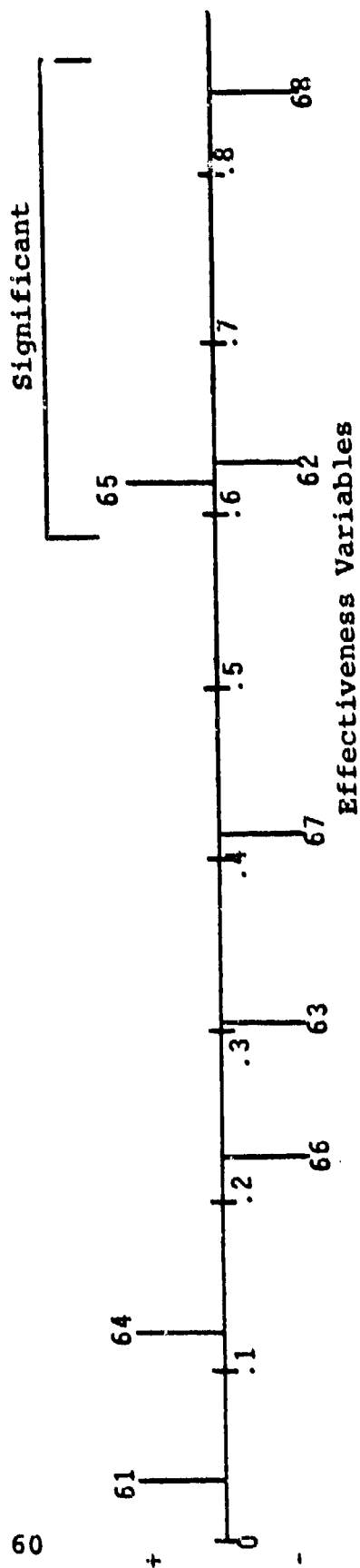
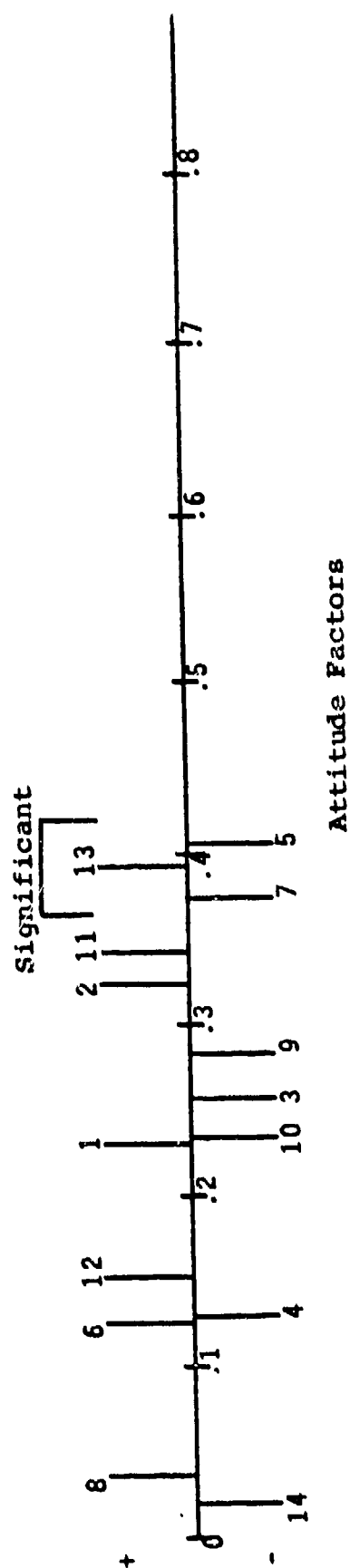


Fig. 4. Relationship 3

summary information and an interpretation of the relationship's meaning are also presented. A complete listing of the canonical correlation analysis results can be found in Appendix E.

Relationship 1

<u>Eigenvalue</u>	<u>Canonical Correlation Coefficient</u>	<u>Stat. Sig.</u>
0.63277	0.79547	Better than .001

Loading

Attitude Variables

0.459	Satisfaction with immediate supervisor
0.411	An individual's satisfaction with his work
0.380	Communication from management concerning performance measurement
0.363	Satisfaction with the organization's decision making structure

Effectiveness Variables

0.369	Production quality
0.334	Production quantity
0.291	Problem anticipation

Interpretation: This relationship implies that work situations in which people are satisfied with

1. their work,
2. their supervisor,
3. the organization's decision making structure,
and
4. the communication that they get from management
concerning performance measurement;

are work situations where

1. the quality and quantity of output produced
is high, and
2. the people do a good job of anticipating
problems.

Relationship 1 is the strongest relationship between attitudes and effectiveness that was identified in this research, and is consistent with theories which imply that there is a direct relationship between attitudes and organizational effectiveness. For example, the relationship is supportive of recent efforts in the job enrichment area which are designed to improve organizational performance by making the work situation more satisfying. It is interesting, however, that worker satisfaction does not significantly affect all of the eight elements of organizational effectiveness. Only production output and problem anticipation are significantly affected by high worker satisfaction with the four identified attitude factors.

Relationship 2

<u>Eigenvalue</u>	<u>Canonical Correlation Coefficient</u>	<u>Stat. Sig.</u>
0.21039	0.45868	0.002
<u>Loading</u>	<u>Attitude Variables</u>	
0.579	Presence of constraints to job performance and productivity	
-0.437	Degree of difficulty of the job	
-0.406	An individual's satisfaction with his work	
	<u>Effectiveness Variables</u>	
-0.736	Promptness of adaptation	
-0.647	Production quality	
-0.639	Prevalence of adaptation	
0.584	Production quantity	

Interpretation: This relationship indicates that in work situations where

1. there are perceived constraints to job performance and productivity,
2. jobs are not very difficult, and
3. individuals are not satisfied with their work;

we can expect to find

1. low promptness of adaptation,
2. low production quality,
3. high prevalence of adaptation, and
4. high production quantity.

In relationship 2 we have a very different picture, in terms of attitudes, than in relationship 1. Here the attitude situation is more unhealthy since the worker is not satisfied with his work, and perceives constraints and a less than difficult job. As might be expected, while we had high production quality with the favorable attitude situation in relationship 1 we have low production quality with the unfavorable attitude situation in relationship 2. However, production quantity is high in both cases which leads one to believe that a decrease in worker satisfaction might result in a decrease in production quality while the quantity of output produced can be high with high or low satisfaction. The association of low promptness of adaptation with what is perceived to be an unhealthy attitude situation seems reasonable. However, the high prevalence

of adaptation certainly adds to the complication of this relationship since there does not appear to be any clear or reasonable explanation for high prevalence of adaptation in this situation.

Relationship 3

<u>Eigenvalue</u>	<u>Canonical Correlation Coefficient</u>	<u>Stat. Sig.</u>
0.17241	0.41523	0.020

Loading

Attitude Variables

-0.406	Communication from management concerning work quality standards
0.396	Amount of responsibility that an individual has on the job
-0.376	Amount of participation allowed in the goal setting process

Effectiveness Variables

-0.852	Flexibility
-0.633	Production quality
0.618	Awareness

Interpretation: The third significant relationship was interpreted to mean that work situations where there is

1. a lack of communication from management concerning work quality standards,
2. a large amount of individual worker responsibility on the job, and
3. low participation in goal setting;

are work situations where one finds

1. high flexibility
2. low production quality, and

3. low awareness of new techniques, procedures, and equipment.

Relationship 3 is the least significant relationship and appears to be more complicated than relationship 1 or relationship 2. The significant attitude factors in relationship 3 describe a situation where there is limited contact between management and the workers. The worker is left on his own as far as responsibility for his work is concerned and is not allowed a great deal of say in the goal setting process. On the effectiveness side the high flexibility in coping with emergencies may be a result of the worker being left alone to fend for himself and make decisions without the aid of management. In this kind of a situation the worker might, through experience, become accustomed to making decisions on his own with little input from management. This could help the worker learn to act quickly in response to emergencies without waiting for guidance from management, and therefore improve work group flexibility in response to change and emergencies. There are some negative aspects on the effectiveness side of this situation--these are low production quality and low awareness. One of management's basic functions is to serve as a link between the environment and the operating levels of the organization. The low awareness of new techniques, procedures, and equipment may be a result of the limited communication between management and the workers that is

described by the attitude side of this relationship. This indicates that the linking function between operating levels and the environment might be a very important management function as far as organizational effectiveness is concerned.

CHAPTER IV

SUMMARY, LIMITATIONS, CONCLUSIONS, AND RECOMMENDATIONS FOR FURTHER RESEARCH

Summary

As presented in the problem statement, the basic reason for this research was to discover the specific relationships between member attitudes and the effectiveness of a missile wing's operations directorate. If significant relationships could be identified, they might suggest areas of concentration for future programs designed to improve missileer morale and missile unit effectiveness.

The first problem was to arrive at a satisfactory definition of attitude and effectiveness variables and then to find a way to measure these variables. A study by Mott utilized the concept that organizational effectiveness consists of various aspects, which include the following:

1. Production Quantity--quantity of output, specifically in terms of how much is produced.
2. Production Quality--quality of output, specifically the degree of excellence of the output produced.
3. Efficiency--efficiency with which output is produced, specifically the greatest output for the least input.

4. Problem Anticipation--ability to anticipate and develop solutions to problems in advance.

5. Awareness--keeping current with new technologies and techniques that pertain to areas of organizational operations.

6. Promptness of Adaptation--how quickly members of the organization accept and adapt to changes.

7. Prevalence of Adaptation--the relative number of people who readily adjust to problem solutions.

8. Flexibility--how well the organization handles unexpected, temporary situations and emergencies (23:20).

A series of eight questions were developed by Mott to measure effectiveness in terms of these aspects. These questions have been shown to be direct, reliable measures of effectiveness and were used as the effectiveness variables in this research (12:90).

The selection of suitable attitude variables was a more difficult problem. Due to the research findings which indicate that attitudes are comprised of many different aspects, the decision was made to select a technique that included a wide variety of attitude dimensions. A suitable instrument was available in the form of a questionnaire that had previously been used by the U.S. Air Force and others in conducting similar attitude research. This

questionnaire was modified for use in this research effort. The questions are included in Appendix A.

The effectiveness and attitude data were obtained from the 44th Strategic Missile Wing Operations Directorate, located at Ellsworth Air Force Base, South Dakota. The questionnaire was administered to all members of the population.

Factor analysis was used to reduce the sixty attitude variables to fourteen factors, twelve of which could be distinctly identified. These factors were considered to represent the attitude data and were used in the canonical correlation analysis.

Canonical correlation analysis was used to disclose relationships between the attitude factors and the effectiveness variables. Three significant canonical relationships were found to exist. Although these relationships cannot be considered normative, they do suggest areas for conjecture and for future research. The three significant relationships are explained at the end of Chapter III and are summarized in Figure 5.

Limitations

The results of this research must be considered in light of two limitations to the research findings:

1. the possibility of data bias, and

RELATIONSHIP 1	RELATIONSHIP 2	RELATIONSHIP 3
<p><u>Attitudes</u></p> <p>High satisfaction with work, supervisor, decision making structure, and communication from management concerning performance measurement.</p> <p>↓ ↑</p> <p><u>Effectiveness</u></p> <p>High production quality, and quantity; and good job of anticipating problems.</p>	<p><u>Attitudes</u></p> <p>Many constraints to performance and productivity, low degree of job difficulty, and low satisfaction with work.</p> <p>↓ ↑</p> <p><u>Effectiveness</u></p> <p>Low adaptation promptness, low production quality, high adaptation prevalence, and high production quantity.</p>	<p><u>Attitudes</u></p> <p>Lack of communication from management concerning work quality standards, large amount of worker responsibility, and low participation in goal setting.</p> <p>↓ ↑</p> <p><u>Effectiveness</u></p> <p>Good flexibility, low production quality and low awareness.</p>

Fig. 5. Summary of Significant Relationships

2. the fact that the research findings are restricted to the subject population.

Data Bias

Data bias is a possible research limitation. However, for reasons that were explained in Chapter III, data bias is not considered a bad situation for the purposes of this research. Therefore, although the data is likely to be biased due to nonrespondents, it should not adversely impact the research results.

Restriction of Findings to Subject Population

The research findings are limited to the 44th Strategic Missile Wing Operations Directorate at Ellsworth AFB. Although there are many similarities between the different missile wings in SAC such as structure, function, technology, etc., any attempts to generalize the findings to a larger population, such as the entire SAC missile force, can only be done with caution.

Consideration must also be given to the time that the study was accomplished. Due to the dynamic nature of organizations and relatively high turnover rate found in military organizations, similar studies conducted in the same unit at a later time might result in different findings.

Conclusions

The research objective was satisfied since significant relationships between attitudes and organizational effectiveness, as outlined in Figure 5, were identified. It was originally hypothesized that there are significant relationships between member attitudes and organizational effectiveness in a strategic missile wing operation directorate. Satisfaction of the research objective confirmed this hypothesis.

Consideration must now be given to the meaningful information provided by the research results. Relationship 1 has a canonical correlation coefficient of .80 and therefore must be considered more meaningful than Relationship 2 or Relationship 3 which had correlation coefficients of .46 and .42 respectively. Relationship 1 tells us that there is a correlation between worker satisfaction with such factors as supervision, the work accomplished, communication from management concerning performance measurement, and the organization's decision making structure; and the organization's productivity and ability to anticipate future problems. The value of the information provided by Relationship 1 lies in its confirmation of the belief that increased worker satisfaction will result in improved organizational performance; however, it is important to realize that the relationships between

effectiveness and attitudes are not quite this simple. As illustrated by the research results, relationships between organizational effectiveness and attitudes are complex. While changes in some attitudes may improve specific elements of organizational effectiveness, they may have no effect, or negative effects, on other effectiveness elements. The results of this research suggest that, in a strategic missile wing, attitudes and organizational effectiveness are both multidimensional factors. If the managers of SAC's missile units hope to improve the effectiveness of their organizations by making changes that affect attitudes then they must understand the complex relationships that exist. An examination of the relationships identified in this research could add to this understanding.

Recommendations for Further Research

For this research it was assumed that the results of the Mott questions were valid measures of organizational effectiveness. This method of evaluating organizational effectiveness has been verified in previous studies. No attempt was made to correlate the results of Mott's questions with the results of other effectiveness measures (such as ORI's and 3901st SMES evaluations) that are currently being used to evaluate the effectiveness of SAC's missile organizations. Such an attempt is a possibility

for further research which could uncover useful information about the validity of missile unit effectiveness measures.

Another possibility for further research would be to conduct studies similar to this research in different missile units. Future studies in other missile units might lead to a general theory about the nature of attitude-effectiveness relationships in SAC missile organizations.

A third possibility for further research would be an examination of the causality of attitude-effectiveness relationships in SAC missile units. Due to the nature of canonical correlation analysis, no conclusions can be made about causality from the results of this research. If future research could prove that specific kinds of attitudes cause definite effectiveness results then management would have access to a tool that might be used to improve certain elements of missile unit effectiveness that are known to be lacking.

APPENDICES

APPENDIX A
ORGANIZATIONAL EFFECTIVENESS AND ATTITUDE SURVEY

DEPARTMENT OF THE AIR FORCE
AIR FORCE INSTITUTE OF TECHNOLOGY (AU)
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433



REPLY TO
ATTN OF: LSGR (LSSR 16-78E/Capt R. Boatright/Capt R. McCaskey/
AUTOVON 785-4698)

10 May 1978

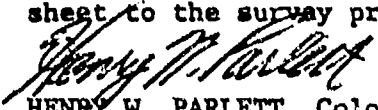
SUBJECT: Organizational Effectiveness and Attitude Survey

TO:

1. The attached questionnaire was prepared by a research team at the Air Force Institute of Technology, Wright-Patterson AFB, Ohio. The purpose of the questionnaire is to acquire data that can help reveal the relationships between member attitudes and organizational effectiveness in a strategic missile wing operations complex.

2. You are requested to provide an answer or comment for each question. Headquarters USAF Survey Control Number 78-104 has been assigned to this questionnaire. Your participation in this research is voluntary.

3. Your responses to the questions will be held confidential. Please remove this cover sheet before returning the completed questionnaire. Your cooperation in providing this data will be appreciated and will be very beneficial in examining the relationships between attitudes and organizational effectiveness. Please return the completed answer sheet to the survey project officer in your unit.


HENRY W. PARLETT, Colonel, USAF
Associate Dean for Graduate
Education
School of Systems and Logistics

1 Atch
Questionnaire

INSTRUCTIONS FOR COMPLETING SURVEY

This survey is designed to measure your attitudes toward your job and your perceptions of the effectiveness of your unit.

Please do not put your name on the response sheet.

Your answers to these questions will be kept confidential and no attempt will be made to identify any individual by name. Your frank, honest answers to each question are desired and needed. We would like you to answer all questions in this booklet. If you feel, however, that a question does not apply in any way to your job, you may skip that question and not respond.

Please read each question carefully, then read each of the answers given. Choose one statement that best describes your feelings or opinion. Then, make a mark on the answer sheet corresponding to that answer. Always make sure that the number on the answer sheet is the same as the number of the question. If you wish to change an answer, be sure to erase the first mark completely. The survey should take approximately 30 minutes to complete.

PRIVACY STATEMENT

In accordance with paragraph 30, AFR 12-35, the following information is provided as required by the Privacy Act of 1974:

a. Authority:

- (1) 5 U.S.C. 301, Departmental Regulations, and/or
- (2) 10 U.S.C. 8012, Secretary of the Air Force, Powers, Duties, Delegation by Compensation; and/or
- (3) EO 9397, 22 Nov 43, Numbering System for Federal Accounts Relating to Individual Persons; and/or
- (4) DOD Instruction 1100.13, 17 Apr 68, Surveys of Department of Defense Personnel; and/or
- (5) AFR 30-23, 22 Sep 76, Air Force Personnel Survey Program.

b. Principal purposes. The survey is being conducted to collect information to be used in research aimed at illuminating and providing inputs to the solution of problems of interest to the Air Force and/or DOD.

c. Routine Uses. The survey data will be converted to information for use in research of management related problems. Results of the research, based on the data provided, will be included in written master's theses and may also be included in published articles, reports, or texts. Distribution of the results of the research, based on the survey data, whether in written form or presented orally, will be unlimited.

d. Participation in this survey is entirely voluntary.

e. No adverse action of any kind may be taken against any individual who elects not to participate in any or all of this survey.

1. Your supervisor takes time to listen to job problems.
 - (A) Always
 - (B) Usually
 - (C) Sometimes
 - (D) Infrequently
 - (E) Never
2. Your immediate supervisor uses your ideas on how to improve your job.
 - (A) Always
 - (B) Usually
 - (C) Sometimes
 - (D) Infrequently
 - (E) Never
3. Does your immediate supervisor tell you how your job contributes to meeting unit productivity?
 - (A) Very Much
 - (B) Much
 - (C) Undecided
 - (D) Little
 - (E) Very Little
4. Does your immediate supervisor tell you what's going on at higher levels of management?
 - (A) Very Much
 - (B) Much
 - (C) Undecided
 - (D) Little
 - (E) Very Little
5. Your supervisor shows interest in you as an individual.
 - (A) Definitely Yes
 - (B) Mostly Yes
 - (C) Sometimes
 - (D) Mostly No
 - (E) Definitely No

6. Are you satisfied with the feedback you receive in doing your job?
- (A) Definitely Yes
 - (B) Mostly Yes
 - (C) Sometimes
 - (D) Mostly No
 - (E) Definitely No
7. Are you helped in correcting errors you make?
- (A) Always
 - (B) Usually
 - (C) Sometimes
 - (D) Infrequently
 - (E) Never
8. You help set your own quality goals.
- (A) Always
 - (B) Usually
 - (C) Sometimes
 - (D) Infrequently
 - (E) Never
9. You understand how the quality of your work is measured.
- (A) Always
 - (B) Usually
 - (C) Sometimes
 - (D) Infrequently
 - (E) Never
10. You know the quality standards required for your work.
- (A) Always
 - (B) Usually
 - (C) Sometimes
 - (D) Infrequently
 - (E) Never
11. Your supervisor knows when you do a good job.
- (A) Strongly Agree
 - (B) Agree
 - (C) Undecided
 - (D) Disagree
 - (E) Strongly Disagree

12. Your job is oversupervised.
- (A) Definitely Yes
 - (B) Mostly Yes
 - (C) Sometimes
 - (D) Mostly No
 - (E) Definitely No
13. Your supervisor spends too much time away from his/her work area.
- (A) Strongly Agree
 - (B) Agree
 - (C) Undecided
 - (D) Disagree
 - (E) Strongly Disagree
14. Your supervisor is well qualified for his/her job.
- (A) Strongly Agree
 - (B) Agree
 - (C) Undecided
 - (D) Disagree
 - (E) Strongly Disagree
15. Your supervisor tries to strike a balance between people needs and production needs.
- (A) Definitely Yes
 - (B) Mostly Yes
 - (C) Sometimes
 - (D) Mostly No
 - (E) Definitely No
16. Your supervisor is a capable individual.
- (A) Definitely Yes
 - (B) Mostly Yes
 - (C) Sometimes
 - (D) Mostly No
 - (E) Definitely No
17. Your supervisor understands human relations.
- (A) Definitely Yes
 - (B) Mostly Yes
 - (C) Sometimes
 - (D) Mostly No
 - (E) Definitely No

18. Do you feel that decisions which affect your job are based on technical or engineering analyses?
- (A) Very Much
 - (B) Much
 - (C) Undecided
 - (D) Little
 - (E) Very Little
19. How much satisfaction do you gain from the performance of your job?
- (A) Very Much
 - (B) Much
 - (C) Undecided
 - (D) Little
 - (E) Very Little
20. Think about the specific duties of your job. How often have you felt unable to use your full capabilities in the performance of your job?
- (A) Always
 - (B) Usually
 - (C) Sometimes
 - (D) Infrequently
 - (E) Never
21. You get recognition when you deserve it.
- (A) Always
 - (B) Usually
 - (C) Sometimes
 - (D) Infrequently
 - (E) Never
22. Your work assignment is challenging.
- (A) Almost All of the Time
 - (B) Very Often
 - (C) Half the Time
 - (D) Seldom
 - (E) Almost Never

23. Do you feel you need more freedom in your job assignment to get the work done?
- (A) Almost All of the Time
 - (B) Very Often
 - (C) Half the Time
 - (D) Seldom
 - (E) Almost Never
24. The work schedules in your unit are realistic.
- (A) Strongly Agree
 - (B) Agree
 - (C) Undecided
 - (D) Disagree
 - (E) Strongly Disagree
25. Your job description does reflect the assignments you are given.
- (A) Strongly Agree
 - (B) Agree
 - (C) Undecided
 - (D) Disagree
 - (E) Strongly Disagree
26. How often would you encourage others to seek a job like yours?
- (A) Almost Always
 - (B) Very Often
 - (C) Sometimes
 - (D) Very Seldom
 - (E) Almost Never
27. If given the opportunity or choice would you follow your job to another location in the continental United States?
- (A) Yes
 - (B) Probably
 - (C) Would Consider
 - (D) Probably Not
 - (E) No

28. How many parts of your job would you change if allowed to do so?
- (A) None
 - (B) Very Few
 - (C) Half of Them
 - (D) Most of Them
 - (E) Almost All of Them
29. Do you see constraints to high production in your job?
- (A) Definitely Yes
 - (B) Mostly Yes
 - (C) Sometimes
 - (D) Mostly No
 - (E) Definitely No
30. You help to set the goals of your unit.
- (A) Definitely Yes
 - (B) Mostly Yes
 - (C) Sometimes
 - (D) Mostly No
 - (E) Definitely No
31. You dread going to work.
- (A) Definitely Yes
 - (B) Mostly Yes
 - (C) Sometimes
 - (D) Mostly No
 - (E) Definitely No
32. Everything considered, your job is very satisfactory.
- (A) Definitely Yes
 - (B) Mostly Yes
 - (C) Sometimes
 - (D) Mostly No
 - (E) Definitely No
33. Your rank is too low for the work you do.
- (A) Definitely Yes
 - (B) Mostly Yes
 - (C) Sometimes
 - (D) Mostly No
 - (E) Definitely No

34. You feel responsible for your own efforts at work.

- (A) Strongly Agree
- (B) Agree
- (C) Undecided
- (D) Disagree
- (E) Strongly Disagree

35. You feel a sense of responsibility on your job.

- (A) Strongly Agree
- (B) Agree
- (C) Undecided
- (D) Disagree
- (E) Strongly Disagree

36. You enjoy a feeling of responsibility on your job.

- (A) Strongly Agree
- (B) Agree
- (C) Undecided
- (D) Disagree
- (E) Strongly Disagree

37. Time passes quickly for you on the job.

- (A) Strongly Agree
- (B) Agree
- (C) Undecided
- (D) Disagree
- (E) Strongly Disagree

38. You can obtain tools and/or supplies when they are needed.

- (A) Strongly Agree
- (B) Agree
- (C) Undecided
- (D) Disagree
- (E) Strongly Disagree

39. Your equipment is well maintained.

- (A) Strongly Agree
- (B) Agree
- (C) Undecided
- (D) Disagree
- (E) Strongly Disagree

40. Equipment needed to accomplish the job is available.
- (A) Strongly Agree
 - (B) Agree
 - (C) Undecided
 - (D) Disagree
 - (E) Strongly Disagree
41. You can obtain the parts needed to do your job.
- (A) Strongly Agree
 - (B) Agree
 - (C) Undecided
 - (D) Disagree
 - (E) Strongly Disagree
42. You understand how your production output is measured.
- (A) Strongly Agree
 - (B) Agree
 - (C) Undecided
 - (D) Disagree
 - (E) Strongly Disagree
43. You understand how the quality of your work is measured.
- (A) Always
 - (B) Usually
 - (C) Sometimes
 - (D) Infrequently
 - (E) Never
44. Do you understand how the output of your unit is measured?
- (A) Almost All of the Time
 - (B) Very Often
 - (C) Half the Time
 - (D) Seldom
 - (E) Almost Never
45. You are involved in establishing your production goals.
- (A) Always
 - (B) Usually
 - (C) Sometimes
 - (D) Infrequently
 - (E) Never

46. Material waste can be reduced in your unit?
- (A) Definitely Yes
 - (B) Mostly Yes
 - (C) Sometimes
 - (D) Mostly No
 - (E) Definitely No
47. Would additional technical training improve your chances for promotion?
- (A) Definitely Yes
 - (B) Mostly Yes
 - (C) Sometimes
 - (D) Mostly No
 - (E) Definitely No
48. What part of your job could be performed by a person having less skill than you?
- (A) 20%
 - (B) 35%
 - (C) 50%
 - (D) 70%
 - (E) 100%
49. The people in your unit work together effectively as a team.
- (A) Definitely Yes
 - (B) Mostly Yes
 - (C) Sometimes
 - (D) Mostly No
 - (E) Definitely No
50. Do you feel your co-workers are supporting the production effort in your unit?
- (A) Very Much
 - (B) Much
 - (C) Undecided
 - (D) Little
 - (E) Very Little

51. Do you feel your co-workers are working at their full capacity?
- (A) Definitely Yes
 - (B) Mostly Yes
 - (C) Sometimes
 - (D) Mostly No
 - (E) Definitely No
52. Employees in your area have difficulty in relating their work effort to physical output and/or services.
- (A) Strongly Agree
 - (B) Agree
 - (C) Undecided
 - (D) Disagree
 - (E) Strongly Disagree
53. Communication between the people in your unit and the wing staff is good.
- (A) Definitely Yes
 - (B) Mostly Yes
 - (C) Sometimes
 - (D) Mostly No
 - (E) Definitely No
54. How often do you successfully complete difficult jobs?
- (A) Always
 - (B) Usually
 - (C) Sometimes
 - (D) Infrequently
 - (E) Never
55. Do you feel that upper levels of management understand the problems you face in doing your job?
- (A) Definitely Yes
 - (B) Mostly Yes
 - (C) Sometimes
 - (D) Mostly No
 - (E) Definitely No

56. Do you feel your immediate supervisor knows and understands the problems you have in doing your jobs?
- (A) Definitely Yes
 - (B) Mostly Yes
 - (C) Sometimes
 - (D) Mostly No
 - (E) Definitely No
57. How often do you feel that the right decisions are made at upper levels of management?
- (A) Always
 - (B) Usually
 - (C) Sometimes
 - (D) Infrequently
 - (E) Never
58. How often do you feel that the right decisions are made at intermediate levels of management?
- (A) Always
 - (B) Usually
 - (C) Sometimes
 - (D) Infrequently
 - (E) Never
59. Do you feel that decision makers at wing level are aware of squadron level problems?
- (A) Definitely Yes
 - (B) Mostly Yes
 - (C) Sometimes
 - (D) Mostly No
 - (E) Definitely No
60. Do you feel decisions are made at the proper level of supervision?
- (A) Definitely Yes
 - (B) Mostly Yes
 - (C) Sometimes
 - (D) Mostly No
 - (E) Definitely No

61. Thinking of the various services (administrative services, training, counseling, evaluation, planning, scheduling, etc.) produced by the people you know in your unit, how much are they producing?
- (A) Their production is very high
 - (B) It is fairly high
 - (C) It is neither high nor low
 - (D) It is fairly low
 - (E) It is very low
62. How good would you say is the quality of the services produced by the people you know in your unit?
- (A) Their services are of excellent quality
 - (B) Good quality
 - (C) Fair quality
 - (D) Their quality is not too good
 - (E) Their quality is poor
63. Do the people in your unit seem to get maximum output from the resources (money, people, equipment, etc.) they have available? That is, how efficiently do they do their work?
- (A) They do not work efficiently at all
 - (B) Not too efficient
 - (C) Fairly efficient
 - (D) They are very efficient
 - (E) They are extremely efficient
64. How good a job is done by the people in your unit in anticipating problems that may come up in the future and preventing them from occurring or minimizing their effects?
- (A) They do an excellent job in anticipating problems
 - (B) They do a very good job
 - (C) A fair job
 - (D) Not too good a job
 - (E) They do a poor job in anticipating problems

65. From time to time newer ways are discovered to organize work, and newer equipment and techniques are found with which to do work. How good a job do the people in your unit do at keeping up with these changes that could affect their work?
- (A) They do a poor job of keeping up to date
 - (B) Not too good a job
 - (C) A fair job
 - (D) They do a good job
 - (E) They do an excellent job of keeping up to date
66. When changes are made in the routines or equipment, how quickly do the people in your unit accept and adapt to these changes?
- (A) Most people accept and adjust to them immediately
 - (B) They adjust very rapidly, but not immediately
 - (C) Fairly rapidly
 - (D) Rather slowly
 - (E) Most people accept and adjust to them very slowly
67. What proportion of the people in your unit readily accept and adjust to these changes?
- (A) Considerably less than half of the people accept and adjust to these changes readily
 - (B) Slightly less than half do
 - (C) The majority do
 - (D) Considerably more than half do
 - (E) Practically everyone accepts and adjusts to changes readily
68. From time to time emergencies arise, such as crash programs, schedule changes, equipment failures, or a breakdown in the flow of work occurs. When these emergencies occur, they cause work overloads for many people. Some work groups cope with these emergencies more readily and successfully than others. How good a job do the people in your unit do in coping with these situations?
- (A) They do a poor job in handling emergency situations
 - (B) They do not do very well
 - (C) They do a fair job
 - (D) They do a good job
 - (E) They do an excellent job of handling these situations

69. What is your rank?

- (A) E5 or below
- (B) E6 to E9
- (C) O1 to O3
- (D) O4 to O6

70. Are you a missile combat crewmember?

- (A) Yes
- (B) No

Respond to either Question 71 or Question 72 by marking the response that corresponds to the organizational entity you work in.

71. (A) DOA
(B) DOT
(C) DO9
(D) DO24
(E) DOV

72. (A) DO22
(B) 66 SMS
(C) 67 SMS
(D) 68 SMS

APPENDIX B
SPSS PROGRAM

08/01/78 14.45

```
$ IDENT WP1149,AFIT/LSG RL BOATRIGHT STU 78B
$ SELECT SPSS/BIGSPSS
$ LIMITS 25,65K,6K,2K
$ FILE FW,F1S,5L
$ FILE 16,F2S,5L
RUN NAME FACTOR ANALYSIS - THESIS
VARIABLE LIST LN1,VAR001 TO VAR062,LN2,VAR063 TO VAR072
INPUT FORMAT FIXED(1X,F6.0,62A1/1X,F6.0,10A1)
N OF CASES 167
INPUT MEDIUM CARD
RAW OUTPUT UNIT16
RECODE VAR001 TO VAR072 ('A'=5) ('B'=4) ('C'=3) ('D'=2)
('E'=1) ('F'=0)
MISSING VALUES VAR001 TO VAR072 (0)
FACTOR VARIABLES=VAR001 TO VAR060/TYPE=PA2/ROTATE=VARIMAX/
FACSCORE=.5
OPTIONS 2
STATISTICS 1,2,4,5,6,7
READ INPUT DATA
$ SELECTA THESIS
SAVE FILE THESIS2
FINISH
$ SELECT SPSS/BIGSPSS
$ LIMITS 10,50K,6K,1K
$ FILE 08,F2K
$ FILE FR,F1R
RUN NAME CANONICAL ANALYSIS - THESIS
GET FILE THESIS2
ADD VARIABLES FAC01 TO FAC14
INPUT MEDIUM DISK,REWIND
INPUT FORMAT FIXED(8F10.6/6F10.6)
MISSING VALUES VAR061 TO VAR068 (0)/FAC01 TO FAC14 (999.0)
CANCORR VARIABLES=VAR061,VAR062,VAR063 TO VAR068,FAC01 TO FAC14/
RELATE=VAR061,VAR062,VAR063 TO VAR068 WITH FAC01 TO FAC14/
OPTIONS 2
STATISTICS 1,2
READ INPUT DATA
FINISH
$ ENDJOB
```

*

APPENDIX C
MEANS, STANDARD DEVIATIONS, AND
NUMBER OF RESPONDENTS (CASES)

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FACTOR ANALYSIS - THESIS

FILE NONAME (CREATION DATE = 07/21/78)

VARIABLE	MEAN	STANDARD DEV	CASES
VAR001	4.3675	0.7885	166
VAR002	3.5697	0.8057	165
VAR003	3.5389	1.1234	167
VAR004	3.6084	1.1161	166
VAR005	4.1084	1.0092	166
VAR006	3.4699	1.0541	166
VAR007	4.0659	0.8297	167
VAR008	3.9217	1.1755	166
VAR009	3.8554	0.9925	166
VAR010	4.3413	0.7587	167
VAR011	3.9461	0.8799	167
VAR012	2.6946	1.2501	167
VAR013	2.0915	0.9581	164
VAR014	4.2695	0.9080	167
VAR015	3.8848	1.0673	165
VAR016	4.4518	0.7905	166
VAR017	4.0606	1.0282	165
VAR018	2.8642	1.2781	162
VAR019	3.3054	1.3250	167
VAR020	3.0843	1.0362	166
VAR021	3.4880	0.9954	166
VAR022	3.0778	1.1031	167
VAR023	2.4909	1.1077	165
VAR024	3.7470	0.9641	166
VAR025	3.5090	1.0803	167
VAR026	3.2530	1.1944	166
VAR027	2.8503	1.5740	167
VAR028	3.4242	0.8388	165
VAR029	3.1111	1.1146	162
VAR030	2.7289	1.1724	166
VAR031	2.4491	1.1283	167
VAR032	3.4072	1.1728	167
VAR033	2.0479	1.0744	167
VAR034	4.0723	0.9314	166
VAR035	4.1939	0.9166	165
VAR036	3.9759	1.0557	166
VAR037	3.3234	1.1578	167
VAR038	3.5442	1.0639	163
VAR039	3.5120	1.0075	166
VAR040	3.8049	0.8784	164
VAR041	3.6358	0.9128	151
VAR042	3.4534	1.0837	151
VAR043	3.6890	1.0247	164
VAR044	3.5460	1.1664	163
VAR045	3.1173	1.2024	162
VAR046	3.3500	1.1057	160
VAR047	2.3232	1.0962	164
VAR048	3.0248	1.2647	161
VAR049	3.9512	0.8638	164

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FACTOR ANALYSIS - THESIS

VAR050	3.8848	0.9047	165
VAR051	3.0364	0.9993	165
VAR052	3.1914	1.1007	162
VAR053	3.3713	1.0613	167
VAR054	4.1220	0.9187	164
VAR055	3.3193	1.1176	166
VAR056	4.2892	0.8461	156
VAR057	3.4940	0.7527	166
VAR058	3.5697	0.7004	165
VAR059	3.4667	0.8376	165
VAR060	3.0843	0.9369	166

APPENDIX D
VARIMAX ROTATED FACTOR MATRIX

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CARRIER REGISTERED FACTOR REFERENCE

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	FACTOR 6	FACTOR 7	FACTOR 8	FACTOR 9	FACTOR 10
VAP001	0.74209	0.12330	0.06721	0.13333	0.07584	0.06817	0.12301	0.01098	0.07137	-0.22625
VAP002	0.50311	0.35568	0.06379	0.48552	0.04765	0.08807	0.11102	0.13310	0.04935	-0.18198
VAP003	0.27978	0.15828	0.11160	0.15353	0.11803	0.04337	0.29472	0.04297	0.23362	0.09746
VAP004	0.50516	0.21010	0.16800	0.13681	0.04662	0.07189	0.04308	0.02738	-0.23987	0.18178
VAP005	0.73487	0.22836	0.08310	0.17401	0.28252	-0.03777	-0.01305	0.21808	-0.05949	-0.08179
VAP006	0.42280	0.37624	0.08375	0.14557	0.21364	0.15812	0.19185	0.24549	0.07475	0.22257
VAP007	0.33578	0.11304	0.13159	0.25618	0.52550	-0.03598	0.01753	0.28287	0.06823	-0.16445
VAP008	0.37218	0.22458	0.10388	0.32618	0.09375	0.02805	0.04638	0.15210	0.14201	0.06419
VAP009	0.37559	0.12442	0.11721	0.12728	0.35721	0.21068	0.09308	0.39619	0.17761	0.08773
VAP010	0.08695	0.13282	0.16141	0.5198	0.65660	0.03246	0.18117	0.13496	0.28415	0.03163
VAP011	0.63460	0.18335	-0.00945	0.39225	0.07267	0.18119	0.02258	0.11983	-0.07757	-0.05798
VAP012	-0.26208	-0.28318	-0.18303	-0.37400	-0.08064	-0.35308	-0.00950	-0.12008	-0.11183	-0.15932
VAP013	-0.84402	-0.23584	-0.11737	-0.19731	-0.05767	-0.19731	0.03076	-0.01518	-0.05453	-0.05415
VAP014	0.75123	0.13188	0.05375	0.35778	0.06551	-0.18885	0.03477	0.05592	0.13557	0.02207
VAP015	0.78155	0.18840	0.05378	0.32623	0.07658	0.19105	0.10280	0.12050	-0.07605	-0.12558
VAP016	0.78422	0.17165	-0.05077	0.15733	-0.06890	-0.01756	0.05932	-0.03005	-0.17779	0.17779
VAP017	0.81071	0.35846	0.05231	0.11755	0.33324	0.13989	0.11882	0.10463	0.07164	-0.05427
VAP018	0.09189	0.12523	0.04885	0.19195	0.38353	-0.03259	0.07888	0.27592	-0.05491	0.05428
VAP019	0.19202	0.27917	0.18266	0.13253	0.05782	0.05782	0.15145	0.13778	0.05422	0.05797
VAP020	-0.16157	-0.29452	-0.07529	0.37450	-0.02604	-0.05153	0.03407	-0.05830	-0.12353	0.12353
VAP021	0.48482	0.28296	0.09586	0.16431	0.13134	0.07529	0.03182	0.03406	0.25354	0.05427
VAP022	0.20753	0.25397	0.05187	0.38433	0.11556	0.05163	0.06435	0.07622	0.27152	0.18249
VAP023	0.07422	-0.05352	-0.06880	0.36431	-0.15718	-0.18895	-0.15417	-0.23019	-0.26356	-0.21450
VAP024	0.22478	0.12250	0.03864	0.36417	0.04944	0.22708	-0.05482	0.05524	-0.22452	-0.03473
VAP025	0.12552	0.31500	0.12187	0.15551	0.19255	0.19275	0.09425	0.06336	-0.16579	0.07477
VAP026	0.13227	0.58458	0.11454	0.17481	0.00341	0.2728	0.18473	0.16380	0.10223	0.03456
VAP027	0.10293	0.53975	-0.10564	0.37831	0.12774	0.03720	0.17016	0.33687	0.05437	-0.03528
VAP028	0.16453	0.03363	0.27877	0.37452	0.22120	0.15878	0.17480	0.23795	0.05388	0.18111
VAP029	-0.27477	0.33338	-0.05181	0.27221	0.06381	-0.05159	-0.17937	-0.07933	-0.18525	-0.18121
VAP030	0.23584	0.38529	0.16282	0.23221	0.15821	0.07168	0.54327	0.02600	-0.03189	0.15749
VAP031	-0.19360	-0.51924	-0.27186	-0.25711	-0.06114	-0.11772	-0.22982	-0.13552	0.14072	-0.03455
VAP032	0.26528	0.23503	0.17787	0.39124	0.09554	0.03339	0.21309	0.23702	0.05512	-0.03227
VAP033	0.13325	0.15765	0.11157	0.37160	0.04804	-0.03379	0.04750	0.21222	0.57792	0.05430
VAP034	0.17452	0.37417	0.11221	0.17471	0.19569	-0.02227	0.24462	0.22288	-0.16545	0.05453
VAP035	0.24481	0.25567	0.06977	0.30660	-0.05262	0.11755	0.15005	0.12486	0.39137	0.05787
VAP036	0.22550	0.51114	-0.06219	0.28482	-0.16257	0.11808	0.15426	0.13112	-0.06141	-0.03821
VAP037	0.18258	0.71659	0.18126	0.35980	0.04123	0.08337	0.04288	0.10118	0.17834	0.03483
VAP038	0.05151	0.17307	0.78371	0.18031	-0.07538	-0.02810	0.19450	0.11755	-0.031821	-0.03483
VAP039	0.12555	0.38917	0.05562	0.15476	0.07717	-0.02111	0.12453	0.18535	0.11888	0.18111
VAP040	-0.00553	0.25267	0.16151	0.27603	0.06775	0.06775	-0.02133	-0.06263	-0.01625	0.03427
VAP041	0.04183	0.17270	0.05354	0.35522	0.18277	0.17289	-0.08787	0.13834	-0.01118	0.05328
VAP042	0.31783	0.23737	0.15233	0.16773	0.15066	0.23092	0.06458	0.61198	0.06386	0.12466
VAP043	0.32255	0.31204	0.10498	0.13698	0.20817	0.03826	0.05882	0.68238	0.03060	0.03718

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	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	FACTOR 6	FACTOR 7	FACTOR 8	FACTOR 9	FACTOR 10
VAF201	0.28283	0.28779	0.17653	0.22806	0.07219	-0.00310	0.17673	0.50008	0.20315	0.19027
VAF202	0.21104	0.38187	0.18528	0.35218	0.12753	0.12041	0.66176	0.12173	-0.66558	-0.33351
VAF203	0.28066	-0.13056	-0.19888	0.03375	0.04375	-0.04385	0.08121	-0.03999	-0.51213	-0.58492
VAF204	0.11518	0.17166	-0.10556	0.13178	-0.00886	-0.07656	0.00566	0.32816	0.37877	-0.35136
VAF205	0.33276	0.17975	0.35285	0.18508	-0.19012	0.07782	0.00566	0.11102	0.31562	0.19412
VAF206	0.22561	0.33678	0.17225	0.15532	0.18381	-0.02555	0.25228	0.21327	-0.66441	-0.31379
VAF207	0.20182	0.33407	0.17378	0.27501	-0.02582	0.05628	0.13088	0.21387	-0.66441	-0.31379
VAF208	0.16409	0.38284	0.33708	0.18599	0.10125	0.16129	0.13739	0.23306	0.11593	0.037507
VAF209	0.11150	-0.33386	-0.10263	0.26325	-0.27265	-0.28193	0.31557	-0.22857	-0.02356	-0.45224
VAF210	0.19239	0.22852	0.25227	0.03391	0.06706	0.08187	0.33553	0.35207	0.37583	-0.42388
VAF211	0.08552	0.17237	0.12885	0.21570	0.07792	-0.01828	0.00163	0.35119	0.61151	0.35755
VAF212	0.23344	0.21876	0.12531	0.51578	-0.00372	-0.03535	0.17389	0.37566	-0.17468	-0.01828
VAF213	0.13551	0.16514	-0.00095	0.22424	0.02224	0.02245	0.07889	0.23673	-0.17468	-0.01828
VAF214	0.15752	0.23168	0.20783	0.07362	0.28761	0.13895	0.18115	0.05496	0.09918	0.10118
VAF215	0.20612	0.19851	0.26797	0.55528	0.09186	0.17807	0.01867	0.16878	0.07151	0.18441
VAF216	0.27512	0.18091	0.15103	0.71269	-0.06167	-0.08557	0.12684	0.33987	-0.01112	-0.38767
VAF217	0.16360	0.22358	0.25237	0.51281	0.07280	0.18808	0.16225	0.12887	-0.06328	-0.30203

	FACTOR 11	FACTOR 12	FACTOR 13	FACTOR 14
VAF218	0.12551	-0.33905	0.01367	0.35725
VAF219	-0.17335	-0.33587	0.16286	0.35781
VAF220	0.25437	0.25155	-0.38808	0.07448
VAF221	0.25061	0.38126	-0.29371	0.01559
VAF222	0.19511	0.31336	0.10127	0.31207
VAF223	-0.15452	0.27875	-0.11135	0.31780
VAF224	0.03239	0.11836	-0.10482	0.12755
VAF225	0.08128	-0.38853	0.28191	0.01126
VAF226	0.23555	0.22184	0.16855	0.01167
VAF227	0.05279	0.35325	0.15498	0.03576
VAF228	0.17364	0.18283	-0.11987	-0.33540
VAF229	-0.21337	-0.38664	-0.12467	0.32566
VAF230	-0.36973	0.32354	0.15569	0.11122
VAF231	0.19459	-0.11787	0.18873	0.35167
VAF232	0.18512	0.31162	0.38303	0.11033
VAF233	0.11493	-0.38550	0.05793	0.35777
VAF234	-0.16308	0.15516	0.11357	-0.32228
VAF235	0.09106	0.21822	0.18951	0.05640
VAF236	0.22493	0.18664	0.18857	0.32372
VAF237	-0.05338	-0.38363	0.17216	-0.11151
VAF238	-0.08903	0.25273	0.43891	0.32596
VAF239	0.12268	0.18838	-0.40703	0.18977
VAF240	0.10223	-0.38743	0.30987	0.36860

	FACTOR 11	FACTOR 12	FACTOR 13	FACTOR 14
VAR25	0.1521	0.53767	0.1342	0.5983
VAR25	0.03008	-0.19316	0.04358	0.23557
VAR25	0.00334	-0.11825	0.07473	0.28436
VAR27	0.3297	-0.35398	-0.07407	0.32571
VAR28	0.02365	-0.32567	0.13883	0.39111
VAR29	0.05106	-0.39852	-0.04199	0.36750
VAR30	0.06108	0.13103	-0.07568	0.37511
VAR31	-0.01551	-0.37828	-0.10622	0.38829
VAR32	0.00551	0.35806	0.11555	0.30698
VAR33	-0.01582	0.33596	-0.00353	-0.34219
VAR34	0.05535	-0.37578	0.05434	0.32559
VAR35	-0.01953	0.36159	0.02631	0.25595
VAR36	-0.07529	0.31833	0.28321	0.38109
VAR37	0.07583	0.37777	-0.05849	0.20760
VAR38	-0.02518	0.33366	-0.09310	0.38005
VAR39	-0.01725	-0.11332	0.10629	0.10016
VAR40	0.32721	0.18193	0.11331	0.32771
VAR41	0.10071	-0.33791	0.36932	0.38202
VAR42	0.10216	0.38278	0.12015	0.10127
VAR43	0.10430	0.39357	-0.11090	0.35779
VAR44	0.23584	0.35193	-0.33084	0.31452
VAR45	0.06369	-0.33563	0.36333	0.38209
VAR46	0.02750	-0.34263	0.30107	0.32613
VAR47	0.02391	0.32567	0.12185	0.21336
VAR48	0.05022	0.38880	-0.38794	-0.38138
VAR49	0.30367	0.13580	0.33351	-0.38018
VAR50	0.55825	0.31057	0.02330	0.38465
VAR51	0.21891	0.23050	0.32886	0.38288
VAR52	-0.13720	-0.33543	0.11523	0.31539
VAR53	0.08011	0.35910	0.36520	0.33740
VAR54	0.05212	0.37594	0.00827	0.31641
VAR55	-0.15482	0.38507	0.12495	0.37458
VAR56	0.10657	0.23250	0.18477	0.38083
VAR57	0.07234	0.33861	-0.38688	-0.38394
VAR58	0.20892	0.32890	0.33529	0.37717
VAR59	0.02411	-0.10845	0.03721	-0.14882
VAR60	0.08161	-0.35436	0.15139	0.38305

APPENDIX E
CANONICAL CORRELATION ANALYSIS RESULTS

----- CANONICAL CORRELATION ----- DELAY 1987 1

NUMBER	EIGENVALUE	CANONICAL CORRELATION	SILK 8 LAMDA	CHI-SQUARE	D.F.	SIGNIFICANCE
1	0.63277	0.79587	3.14962	282.03670	142	0.000
2	0.21039	0.45868	0.40788	133.33225	91	0.002
3	0.17281	0.41523	0.51600	88.23451	72	0.020

COEFFICIENTS FOR CANONICAL VARIABLES OF THE SECOND SET

	CANVAR 1	CANVAR 2	CANVAR 3
PAC01	0.45926	-0.39180	0.33314
PAC02	0.61110	-0.63586	0.32831
PAC03	0.14312	-0.33694	-0.25872
PAC04	0.36323	-0.37209	-0.13217
PAC05	0.12472	-0.33792	-0.40622
PAC06	0.10150	0.57943	0.13092
PAC07	0.29592	0.53013	-0.37626
PAC08	0.37379	0.22448	0.13826
PAC09	0.06025	0.18353	-0.24359
PAC10	0.16209	0.34995	-0.23543
PAC11	0.20457	0.27145	0.33624
PAC12	0.13454	-0.32657	0.45687
PAC13	-0.09360	0.27818	0.39597
PAC14	0.09426	0.28956	-0.01857

COEFFICIENTS FOR CANONICAL VARIABLES OF THE FIRST SET

	CANVAR 1	CANVAR 2	CANVAR 3
VAP061	0.33439	0.56360	0.03937
VAP062	0.36903	-0.54697	-0.63305
VAP063	-0.05949	-0.12514	-0.30229
VAP064	0.26061	-0.35061	0.11953
VAP065	-0.08374	-0.48529	0.61793
VAP066	0.05774	-0.73635	-0.22769
VAP067	0.01296	-0.63895	-0.41161
VAP068	-0.43198	0.82645	-0.05161

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